RUBBER AND PLASTICS WEEKLY

VOLUME 141 NO. 8 AUGUST 19 1961 ONE SHILLING

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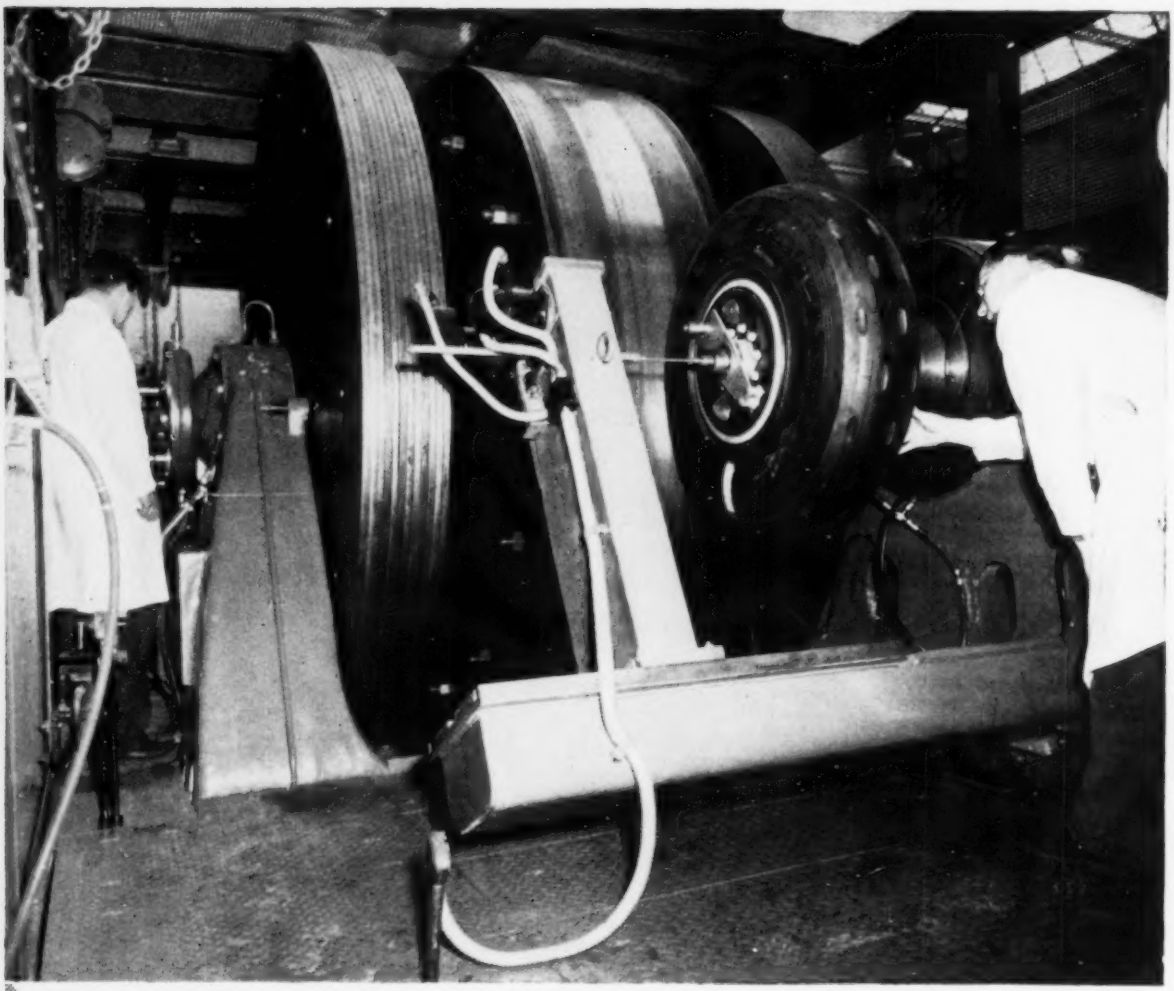

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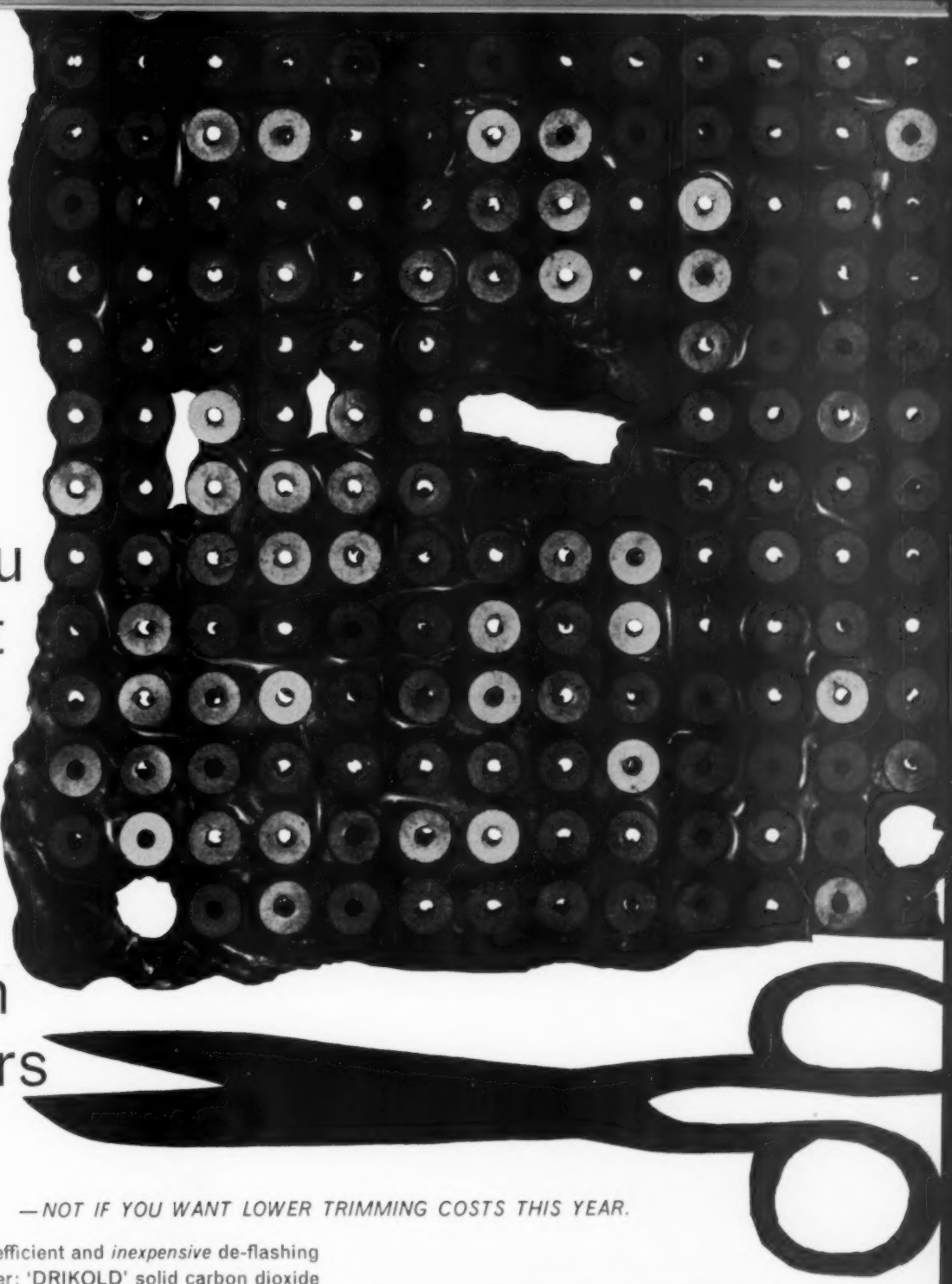

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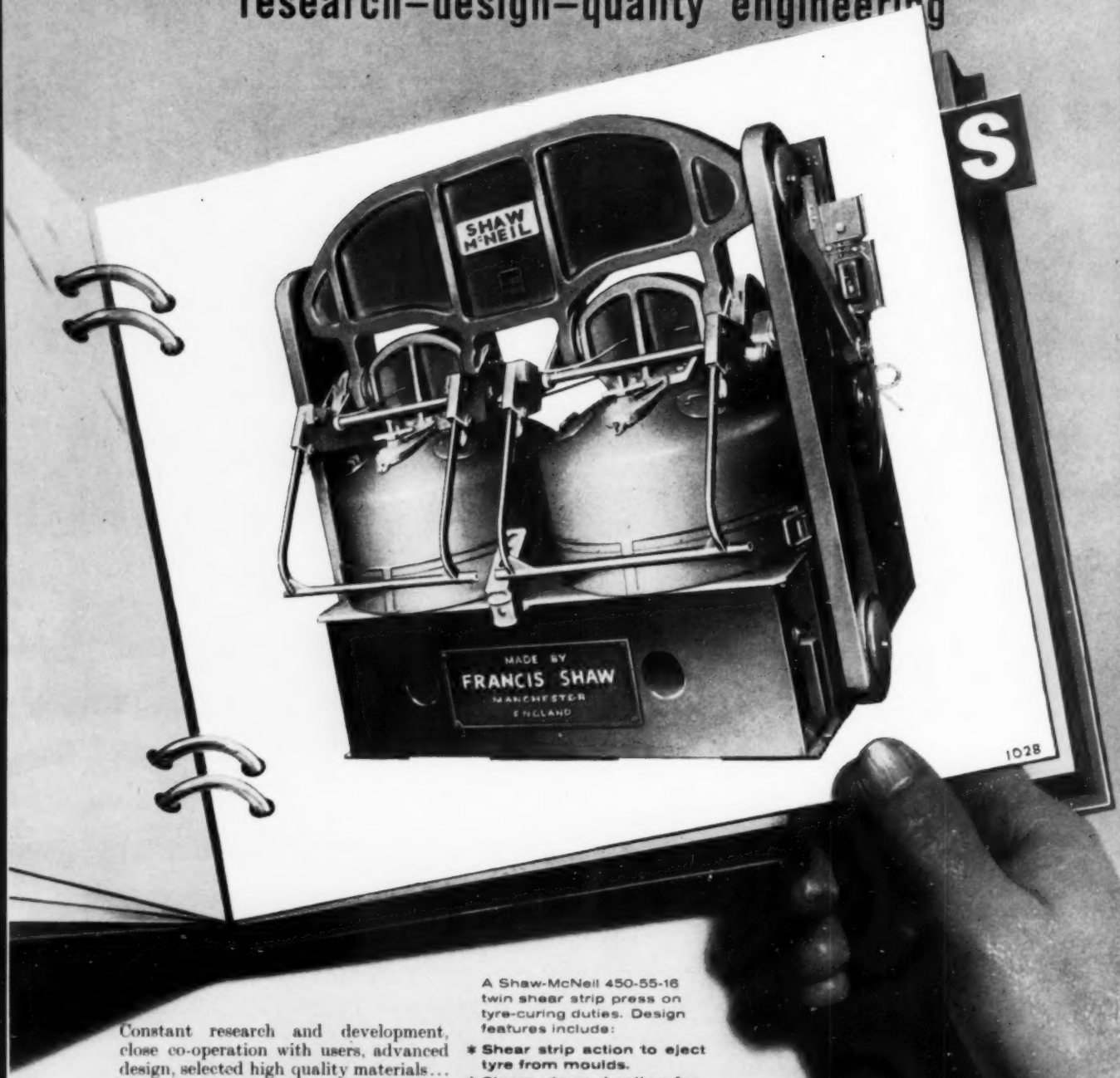

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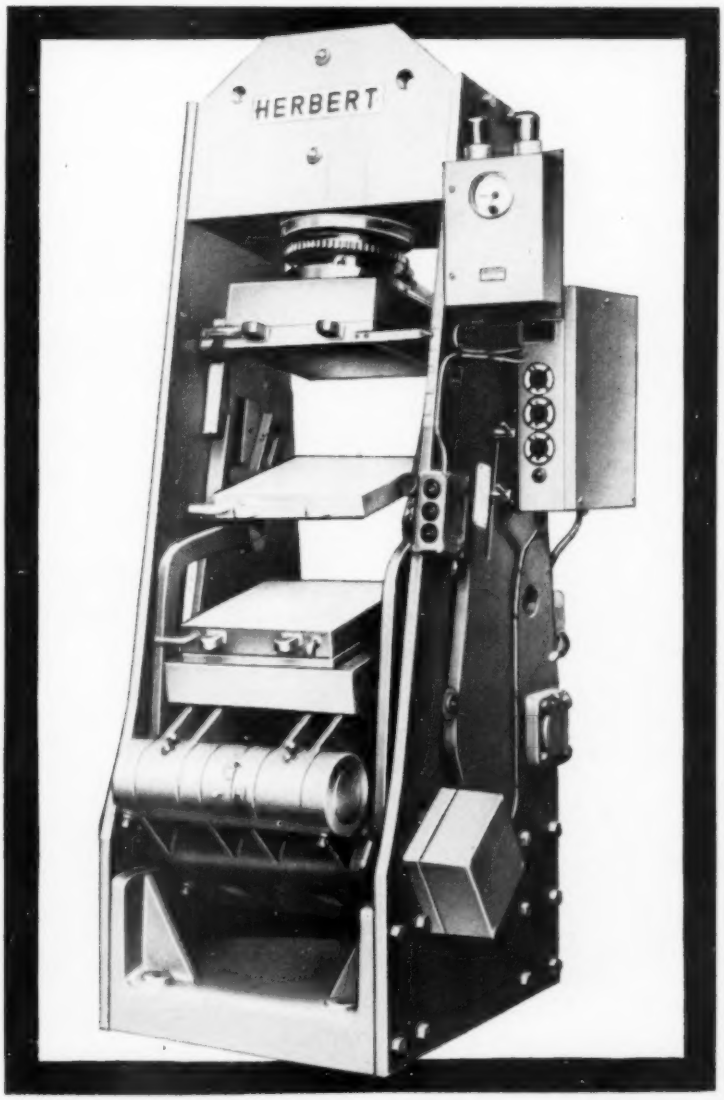
cut curing time

cut physical effort

cut mould costs

WITH

Herbert electric vulcanising presses



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If you would like further details, write for the informative illustrated leaflet to:

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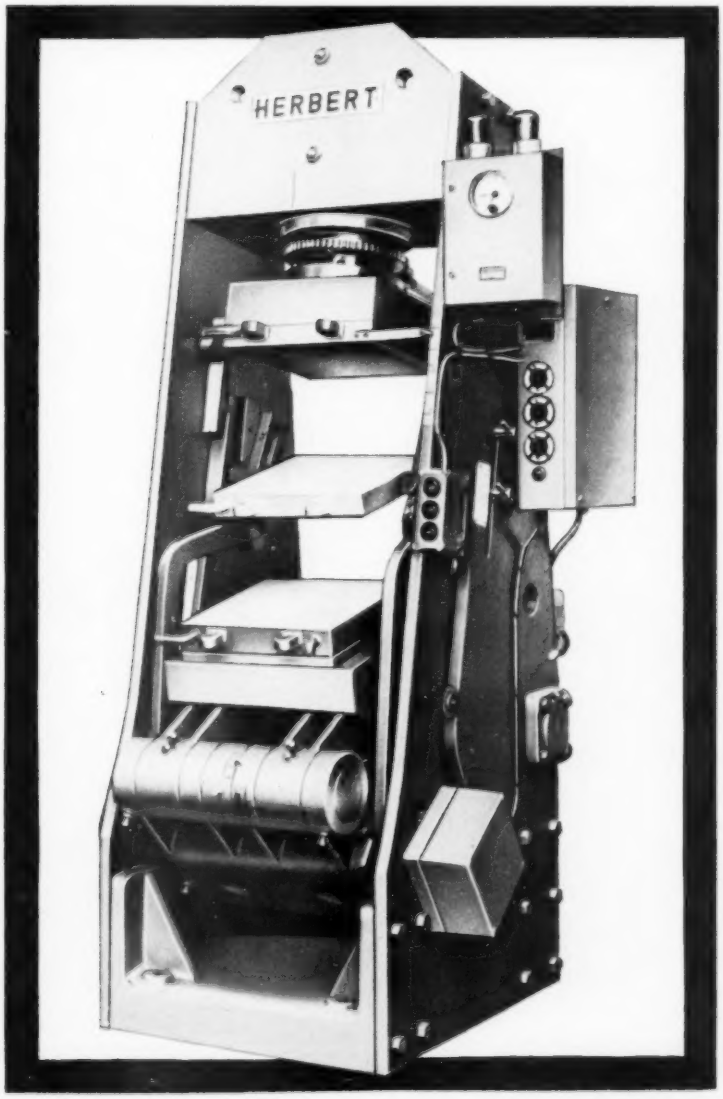

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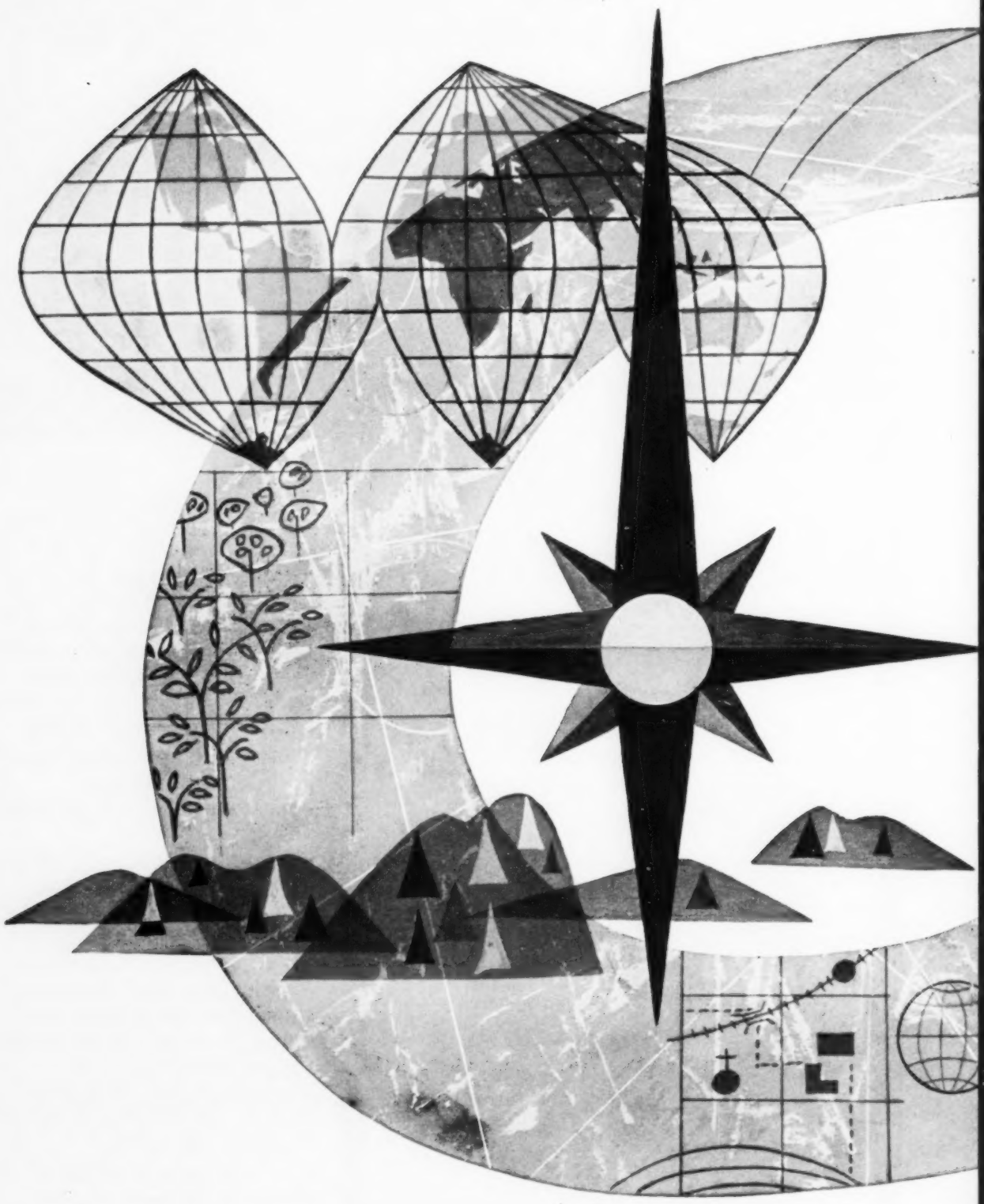

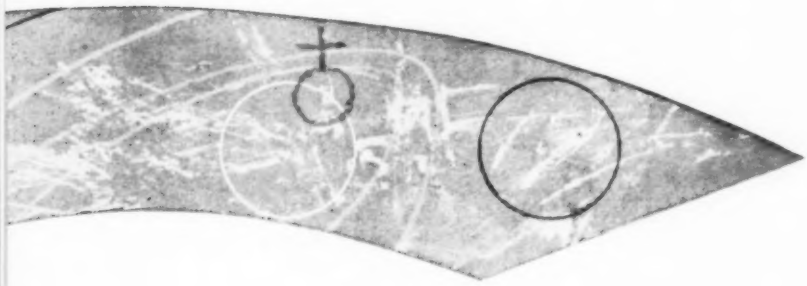

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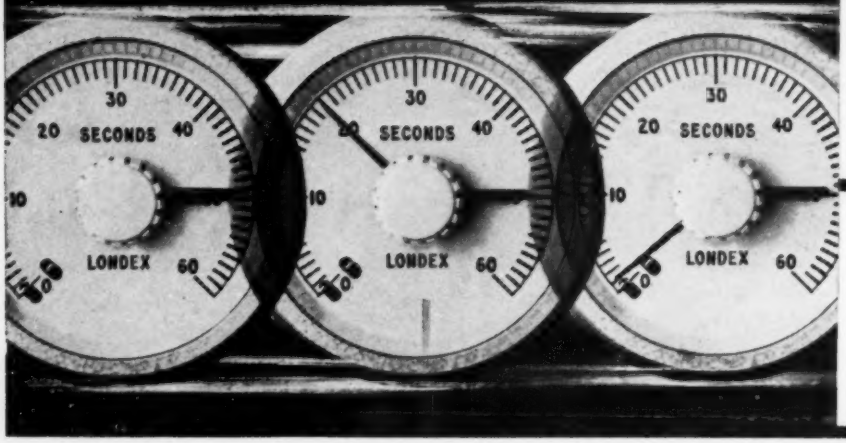

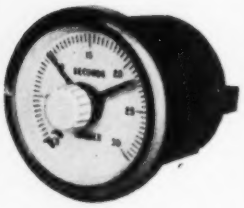

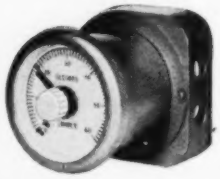

This timer offers a wide variety of contact arrangements without internal rewiring. It is self-resetting, can be started by a remote switch and is of medium price.

The IMP timer is available in two forms, flush mounting and wall mounting. The range includes timers to cover full scale times from 30 secs. with ½ sec. settings, up to 24 hours with 20 min. settings—**some of these available from stock.**

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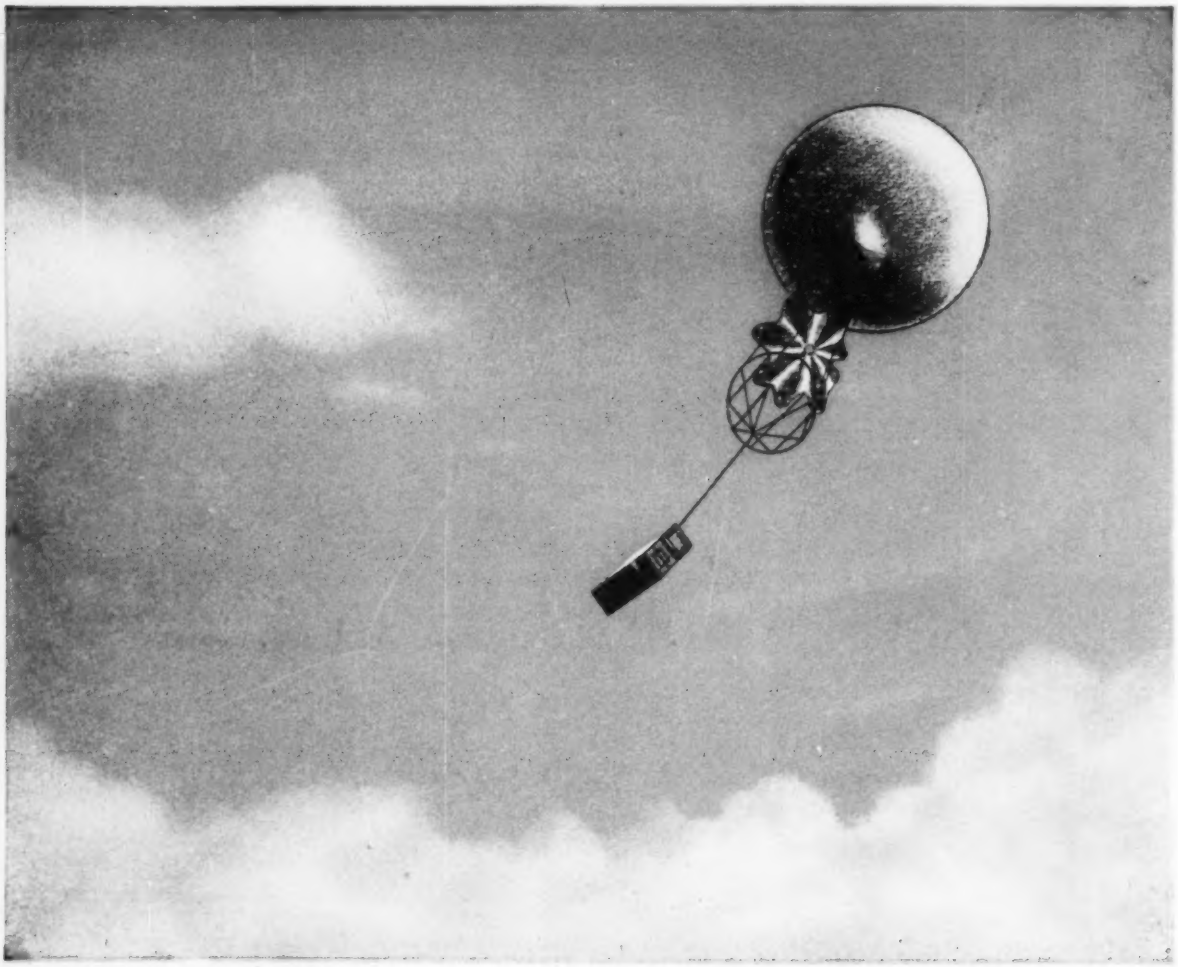

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RUBBER and PLASTICS WEEKLY

Formerly 'Rubber Journal and International Plastics'

Volume 141 IN ITS 78th YEAR No. 8

August 19 1961

Editorial

NOTES OF THE WEEK 273

Articles and News

NEWS BRIEFS 274
PACKAGING FIRM TO CLOSE DOWN 276
ISR NOW MARKETING POLYBUTADIENE 278
EXTRUDER FOR BATCH PRODUCTION 279
PROCESSING VARIABLES IN PREMIX MOULDING ... 280
DYNAMIC PROPERTIES OF RUBBER 284
PLASTICS MACHINERY DEVELOPMENTS 286
GRP IN SPACE 292
THE CHALLENGE TO NATURAL RUBBER 297
FIRST ROUND THE ISLAND 298

Features

VIEWS AND REVIEWS 290
MEN AND MATTERS 294
THE LEGAL ANGLE 295
PLANTATION NEWSLETTER 299
RUBBER STATISTICS 301
RUBBER AND PLASTICS STOCK MARKET 302
RUBBER MARKETS 303
INDUSTRY INTELLIGENCE 304
TRADE MARKS 305

Classified Advertisements . . . 306 Advertisers Index . . . 310

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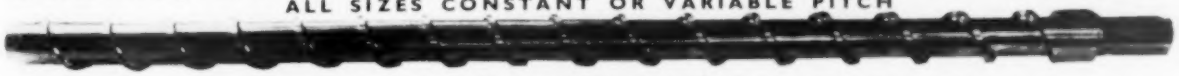

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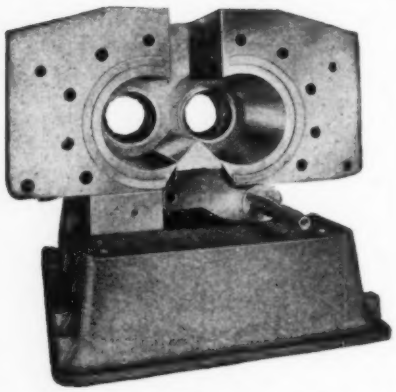
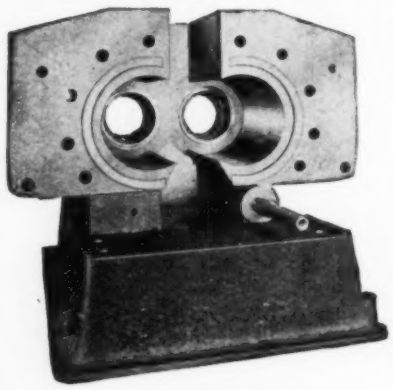
Faster discharge, besides cutting cycle time, is particularly advantageous when formulas require almost instantaneous discharge after pre-determined temperature is reached. With some, a few seconds lag will permit the stock to set up in the mixing chamber.

* ***Banbury is a registered trade mark in many countries throughout the world***



Chamber of Banbury with drop door in closed position



Drop door partially open

Angular view of drop door in open position

Size 11 D-High Pressure high horsepower uni-drive Banbury Mixer with drop type discharge door.

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NOTES of the WEEK

Polydiene Probe

THE big news of the week is undoubtedly the International Synthetic Rubber Co.'s announcement on Tuesday (August 15) that, as sole UK agent, it is to market Firestone's polybutadiene in this country (page 278). With the many claims made for diene rubbers — and the potential they have in the heavy tyre field — this was clearly something that ISR, the sole UK producer of SBR, could not ignore. R. W. Greeff is already marketing development quantities of Phillips's *cis*-polybutadiene, while Durham Raw Materials is handling Goodrich Gulf material. But ISR's move is considered as a marketing probe to assess whether or not it should produce the material in the UK. This would make it the second manufacturer of dienes in this country.

Shell, which has been selling polyisoprene in the UK for some time, is constructing a diene plant at Carrington. This has a design capacity of 20,000 tons and its completion date has been put at '1962/3' — with the increased activity in the field it will probably be 1962 rather than 1963. In developing sales of polyisoprene Shell has already dropped the price: two weeks ago this was cut by 3½d. a lb. to 26.50d. This is about 2d. more than the current spot price of RSS 1 on the London market. And it is level with the price ISR is quoting for polybutadiene — 26d. to 27d. a lb.

The World Picture

SO far as the world picture of dienes is concerned it has been estimated that by 1962/3 the total production could exceed 300,000 tons a year. This is about 15% of the world production of natural rubber (the production figure for 1960 was approximately 2m. tons).

Much has been written about the prospects for natural in a 'polydiene climate'. Some synthetic producers claim that dienes will establish an edge in 'technical superiority', while natural producers generally have stated that the competition will basically resolve itself into a matter of economics. Certainly the work that the natural rubber organizations have put into lowering their production costs — every year increasing areas of high-yielding stocks are being tapped — is bearing fruit at a propitious time. The effects of more efficient production, which will be more marked by the time the polydienes are in full swing, can already be seen. For example, the natural price for the first quarter of this year averaged 25¼d. a lb. This is more than 9d. below the corresponding Mincing Lane quotations for the similar period in 1960 — but at least two producers have announced that sales and costs in the quarter showed a profit margin of only 1d. a lb. less than a year ago. One major factor here, of course, is that natural producers are to a good extent cushioned from low prices by reducing charges for export duty and wage rates, both of which are tied to the price of rubber.

Polymer Information

THE marketing position is an exceedingly complex one, but there is one certain thing. It is not a simple question of natural *versus* synthetic. The polydienes will compete with SBR — and with one another. The rubber manufacturer and his compounder will, more than ever, find himself faced with an embarassment of riches. He will need plenty of information to enable him to assess the potentialities of the various polymers, alone and in combination, for various applications. In future issues *RPW* will be paying special attention to this aspect. Next week an important article by P. G. Croft-White, of Shell Chemical's Plastics and Rubber Division, will contain much practical information on the compounding and processing of polyisoprene. It is hoped to follow this later with a similar article on polybutadiene, and with an article on natural rubber in a 'diene climate'. These articles will help the rubber manufacturer to chart the rapidly changing world of elastomers.

Space the Consumer

MAJOR TITOV'S recent 17 times round the earth flip is a reminder that in the future space is going to be a large consumer of plastics. Considerable quantities are already being used in missiles and rockets. It has been estimated, for example, that 1960 rocket and missile production in USA took up about 8m.lb. of glass-reinforced plastics. By 1970, one authority estimates that as much as one half of the structural weight of all US missile and space systems will be in GRP.

Many technologies have developed from the discoveries of pure research, but this is not the case in the field of space research, at least so far as plastics are concerned. The conditions of space — such as extremes of temperature — are setting the problems, and have led, for example, to the intensification of research to find resins which will withstand the 5,000°-15,000°F. encountered for some seconds in rocket-fuel-combustion chambers without delaminating. The Project Mercury capsule contains the result of much GRP research. GRP is used for the re-entry shield and the astronaut's couch; a new diagram of the capsule appears on page 292 of this issue.

NEWS *Briefs*

MORE HOUDRY DABCO—NORWEGIAN PLAN FLOPS
SYDNEY WORKERS STOOD OFF—CABOT CAMPANA PROGRESS — PLASTICS LAYERS BAFFLE RADAR

●**Japan** — Yokohama Rubber has almost completed polyurethane foam production facilities at its Kawasaki plant. Total expenditure for the new facilities is about Y300m., which consists of facilities for both rigid and soft foam. At first about 100 tons of foam a month will be produced.

●**Spain** — Union Quimica del Norte de España has applied for authorization to expand its plant in the Province of Vizcaya, to manufacture polystyrene and other plastics materials. Raw materials and equipment will be imported and the cost will be an estimated 44m. pesetas.

●**Dominican Republic** — A plan to raise rubber production in the next five years to 10m. lb. annually has been announced by the Dominican Republic Government. A further million rubber trees are to be planted in the central and eastern areas and a sum of $30,850 has been set aside for plantings.

●**Argentina** — Construction of the Cabot Corporation's carbon black plant at Campana, Argentina, has begun, and production is scheduled to start early next year. The petrochemicals required as the raw material will be obtained from the Esso Refinery at Campana. Production is expected to meet 85% of Argentine consumption of 10,000 tons a year, and exports of 3,000-4,000 tons a year of some types seem probable.

●**Australia** — The Australian Division of the Goodyear Tyre and Rubber Co. in Sydney stood off 1,500 workers yesterday (August 18) for a fortnight. During this time the company is suspending production of tyres, tubes and other products; 1,700 employees in other sections of the company are not affected.

●**United States** — Houdry Process Corp. is to more than double its production capacity for DABCO (triethylenediamene) through construction of a second plant at Paulsboro, N.J. An 11,000 sq. ft. warehouse will also be constructed at Paulsboro. This structure is scheduled for completion in September, and the plant by the end of this year. The new plant, to be constructed by Catalytic Construction Co., of Philadelphia, is part of a continuing expansion in production facilities since the foam catalyst was introduced by Houdry three years ago.

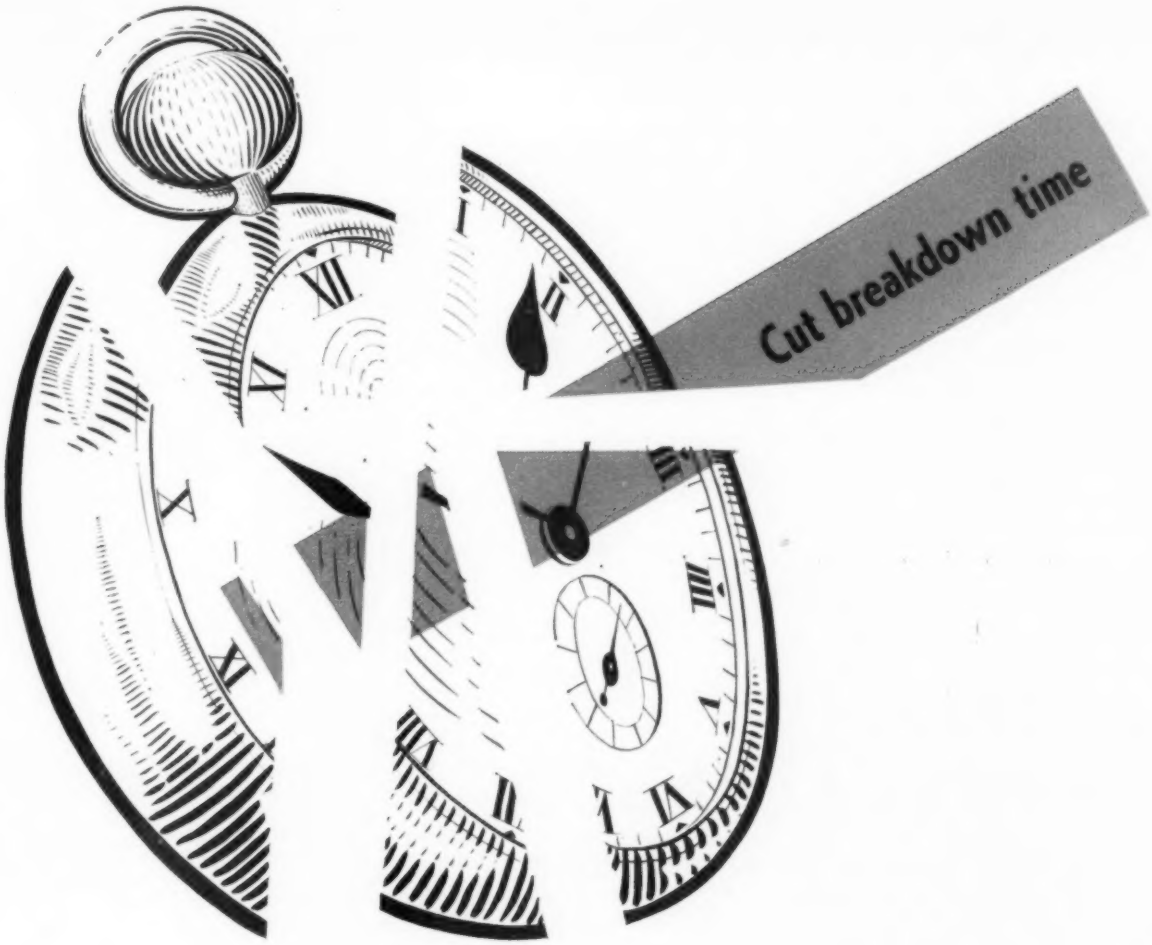
●**Australia** — Research to develop a surface covering that will make guided missiles and aircraft invisible to radar is to be undertaken in Australia by an American scientist, Dr Donald Waidelich, Professor of Electrical Engineering at the University of Missouri, who reached Sydney on August 10. He will continue his research at the University of New South Wales under a Fulbright grant. Dr Waidelich stated that his search for a material to baffle radar would be concentrated on developing layers of plastics film capable of muffling radar waves. Such a surface would render a missile invisible on radar screens.

●**Norway** — The Norwegian interests in the projected factory at Horten, on the Oslo Fjord, for the manufacture of a small GRP-bodied car to be called 'Noble Viking', have withdrawn their support. The project was to be established by British industrialist York Noble, and the car would have been the first to be produced in Norway. According to the chairman of the Horten Council, which had given the project substantial financial backing, the Norwegian interests are withdrawing because the British originators of the plans have not managed to secure the required capital.

●**Holland** — Silenka AKU - Pittsburgh, a glass yarn and glass fibre manufacturing company established jointly by Algemene Kunstzijde Unie (AKU) and Pittsburgh Plate Glass International of Geneva, is to have an authorized capital of 50m. guilders. The company's articles of association, published on August 15, disclose that AKU and Pittsburgh will both hold 6,500 fully-paid shares of 1,000 guilders nominal each. The plant for the new company is to be located at Hoogezand-Sappemeer in the Dutch province of Groningen.

●**United States** — A General Services Administration spokesman said on August 15 that there were no plans to revise sales of US stockpile rubber. Asked about reports from London and Singapore that an announcement was expected regarding the rubber stockpile rotation sales, the spokesman said 'this is news to GSA'. The sales of the stockpile rubber were proceeding satisfactorily and no changes were planned, the spokesman added.

'AIRIs are all right, but ANCRTs are so much more fun!' — 550



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Packaging Firm to Close Down

INTEGRATION MOVE BY I.C.I.

IMPERIAL Chemical Industries Ltd. has decided to close down its subsidiary, The Paper Goods Manufacturing Co. Ltd., at Sutton, Surrey, early in 1962. The company's products include polythene bags.

Paper Goods has been part of the Alkali Division of I.C.I. since 1938, and was originally a subsidiary of Nobel Industries Ltd., one of the companies that merged to form I.C.I. in 1926.

I.C.I. is extending its polythene film-making and conversion facilities at the Stevenage, Herts., factory of British Visqueen Ltd. — another subsidiary — and has decided to combine all such operations under one roof. Thus, as soon as Stevenage is in full production early in 1962, polythene operations at Sutton will cease.

No Interruption

Paper Goods' production of polythene bags and cartons will be transferred gradually to British Visqueen and to the Pembroke Carton Co. I.C.I. says that there will be no interruption in supplies to customers.

The reorganization affects 220 employees, some of whom will be offered other jobs in I.C.I. or in the Pembroke Carton Co. Those for whom alternative employment cannot be found will be treated under I.C.I. arrangements for redundancy — the company adds that it 'hopes that this early announcement of its intentions will help those to whom alternative employment cannot be offered to find suitable work elsewhere'.

I.C.I.'s decision is a further reflection of the company's recent hard thinking in the packaging field. Two weeks ago the company announced that it was entering into an association 'to develop the uses of plastics films in the packaging industry' with E. S. and A. Robinson of Bristol (*RPW*, August 5, 204).

Robinson's is taking a 33⅓% shareholding in the £2m. British Visqueen Ltd., at which, as indicated above, expansion is taking place. In exchange I.C.I. is taking a 49% holding in a new Robinson subsidiary to be called Robinson Plastic Films Ltd.

●Increasing outlets in the polythene packaging field are expected following recent price-cutting of the virgin material down to 1s. 6d.–1s. 7d. a lb.

Europlastique 62

Europlastique 62, organized by the Association Intersyndicale pour les Expositions des Plastiques et Caoutchoucs, which will be held in Paris from May 19-29 1962, will emphasize the close co-operation between the rubber and plastics industries.

It will be associated with four other large exhibitions, covering Engineering, Electricity, Public Works and Shipbuilding.

The European Plastics and Rubber Conference, which will be run parallel with the exhibition, will be held in the UNESCO Palace.

Viscose Move

Courtaulds is to transfer the remaining viscose tyre yarn production at its Foleshill Road, Coventry, works to other more modern plants in the group. Demand for high strength yarns has previously cut the Foleshill production of viscose tyre yarn down to 8% of the group's output.

The move will take place over the next few months. The company's overall production of rayon yarns will not be changed by this concentration. About 650 people at the Foleshill Road works will be affected out of a total of 8,000 in Coventry and district, including the Little Heath factory of British Celanese and the Courtaulds processing mill at Nuneaton.

Vinylidene Laminate for Packaging

LEONARD Stace Ltd., of Cheltenham, is now producing a laminate of Saran vinylidene copolymer film and paper. Stace comments that the low moisture and gas permeability and chemical resistance of Saran film is well known to the packaging industry, but the stronger and more versatile laminate will have a wider field of application.

For example a paper backing offers more scope for printing techniques. Also, it is said, the material can more easily be worked as a general liner or sachet for practically every type of food, chemical, pharmaceutical or similar packaging where the universal protective qualities of Saran are desirable.

First supplies of the laminate, now in production at the Cheltenham works, are destined for use as a bottle-cap lining material.

The properties of vinylidene copolymer film include negligible water absorption, low moisture and gas permeability, resistance to most chemicals (including mineral or organic acids, alkalis, oils, fats and waxes) good strength, ageing and light stability as well as clarity with lustre.

Bulk Isocyanates

First bulk shipment of Du Pont's Hylene organic isocyanates to reach the UK being unloaded at London's Royal Victoria Docks. Two tanks, each weighing 8½ tons when full and containing 1,250 gallons of isocyanates made up the shipment. Du Pont (UK) recently announced that it will construct a plant at Maydown, Northern Ireland, for the manufacture of organic isocyanates, a basic raw material used in the production of urethane foams (*RPW* **July 8, 40**)

W. F. Webb Leaves Barfoot

W. F. Webb states that he has 'ended his association and partnership with T. W. Barfoot of Seaford' and has formed a new company, W. F. Webb (Engineers) Ltd.

The company, based at 7 Manor Road, London, S.E.25, is carrying out repairs and reconditioning of rubber and plastics plant, erection and dismantling of all types of machinery, and manufacture of spare parts and special machines.

The directors of the new company are W. F. Webb, C. C. Harris, P. Richfield and A. M. Clark.

77269

The Glasgow branch of J. H. Fenner and Co. Ltd. is now on Telex. The number is 77269.

This service extends the Telex facilities already at Hull, Birmingham, London and Manchester.

To-day's big rubber news comes from **I.S.R.**

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Highest purity • Narrow molecular weight distribution • Stable price • EX STOCK

DIENE is a new stereospecific polymer with remarkable properties. DIENE is a new elastomer—it has properties which cannot be matched. DIENE is outstanding in four vital qualities—resilience, abrasion resistance, low temperature characteristics and purity.

DIENE's primary use is in compound with other rubbers, when the compound acquires the most valuable DIENE properties. 50% DIENE compounds are characteristic; greater or lesser proportions are of course usable. In production DIENE is economical, it can be readily extended with any of the usual extenders or fillers. DIENE's purity is of special value to the electrical industry, but in any application it results in excellent colour.

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ISR Now Marketing Polybutadiene

PLANS TO DEVELOP SALES TO MANUFACTURING LEVEL

THE International Synthetic Rubber Co. Ltd. of Hythe, Southampton, has been appointed sole UK agent for Diene polybutadiene rubber, it was announced on Tuesday (August 15). The company is now offering the material ex stock to UK users, at a development price of 26d.-27d. a lb. delivered.

Diene is the Firestone Synthetic Rubber and Latex Co.'s trademark for its alkyl lithium catalysed polybutadiene.

At a press conference in London D. A. Bennett, ISR's managing director, stated that ISR had also obtained sole manufacturing rights for Diene in the UK. He indicated that, if development took place satisfactorily, then ISR would commence manufacturing plans for the material 'in about a year'. No site details were revealed, although it was said that the project would not necessarily take place at Hythe, where the company's SBR plant has a capacity of 100,000 tons a year.

During the first year's UK development of the product Mr Bennett estimated that up to 10,000 tons would be sold.

Narrow Molecular Weight Distribution

Completely amorphous, but of linear structure and having a narrow molecular weight distribution, Diene is claimed to have resilience, hysteritic and cold properties superior to NR and SBR. Blended with NR and SBR in tyres it is said to give improved wear and cracking resistance, lowered heat build-up and reduced rolling resistance and petrol consumption.

Properties of the rubber that may prove deficient are those of tensile, lack of tack, and in general poorer processing if not used as a blend with other polymers.

The most important application for the rubber is as a partial replacement for natural rubber in truck tyres. Firestone reports that it has clocked up over 9m. test tyre miles to establish the advantages in tyre properties mentioned above.

Low Temperature Properties

Other applications are expected to make use of good low temperature properties (brittle point is −96°C.) and the electrical properties that spring from its purity (Diene is 98% polymer, the balance being stabilizer, short stop and ash (0.12%)) and absence of polar groups, could lead to outlets in cable insulation.

Mountings and Footwear

Its low temperature properties should also be useful in reducing freezing points of other polymers without increasing extractable material. This applies to nitrile, neoprene, natural and SBR. The dynamic and abrasion resistant properties may lead to applications in belting, hose and footwear, motor mountings, bushings and vibration dampers. The rubber is free of gel, and is soluble in all common rubber solvents and can therefore be used for spreading and adhesives.

Diene rubber is said to process well in blends with other polymers, even if present in rather high percentages. Factory processing operations (mixing, tubing, calendering, tyre building, curing, etc.) have been carried out without much deviation from normal production practice using stocks containing up to 50% of the rubber in treads and 40% in the bodies. However, Diene rubber used alone has a number of characteristics which make it difficult to handle on rubber processing equipment.

Diene stocks can be mill mixed, the rubber forming a band at mill temperatures above 150°F. If a polymer blend is being mixed, the recommended procedure is that the Diene should be added to the other rubber, again keeping the temperatures above 150°F.

Best results are said to be obtained if the rubber stocks are Banbury mixed. In the case of polymer blends, satisfactory results can be obtained either by blending separate black masterbatches of the two polymers or by straight mixing a blend of the two polymers. In either case the stearic acid and zinc oxide should be added early in the cycle along with the carbon black, the softener and antioxidants being added last. Due to the physical character of Diene rubber, Banbury mixing temperatures are said to be usually lower than with other polymers.

In calendering, there is said to be no change in normal procedure for low black stocks containing up to 40% Diene rubber.

Smooth Extrusions

So far as extruding is concerned, in general, Diene rubber stocks are 'dead' and show good conformity to die shape with little tendency to swell. Smooth extrusions are said to be obtained at high loadings of oil and softener. Satisfactory green truck treads can be extruded from 75/25 Diene/natural rubber and 100% Diene rubber stocks.

Firestone's polybutadiene plant at Orange, Texas, went on stream last spring with an annual capacity of 30,000 long tons, and production is scheduled to begin at a plant at Port Jerome, France, late this year.

Firestone's latest announcement in the diene field is that it is to build polybutadiene plant at Recife, Brazil, with a capacity of 27,500 metric tons. Here butadiene will be obtained from alcohol produced from sugar cane.

At ISR's press launching of Diene rubber on Tuesday: D. A. Bennett, managing director of ISR (*left*) and K. G. Burridge, works manager

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Recommended for applications requiring very high oil resistance in easy processing compounds or in normal processing compounds where only low plasticizer loading can be tolerated.

Polysar Krynac 805 is a copolymer of butadiene and acrylonitrile with low raw polymer viscosity. It offers substantial advantages in processing while maintaining vulcanizate properties similar to those of Polysar Krynac 801 NS.

DESCRIPTION

Physical form	bale
Weight of bale (approximate)	75 lb.
Packaging method	talc dusted
Package colour code	white on green
Monomers	butadiene and acrylonitrile
Typical ACN content	38.5%
Polymerization system	low temperature
Stabilizer type	non-staining
Raw polymer viscosity (ML-4 @ 212°F)	47
Specific gravity	0.96

Compound Applications for Polysar Krynac 805

1 Printing plates and printing rolls with low plasticizer content
2 Hose tube stocks with low plasticizer content
3 Roll cover stocks
4 Friction stocks
5 Calendered stocks
6 High hardness stocks
7 Sponge stocks

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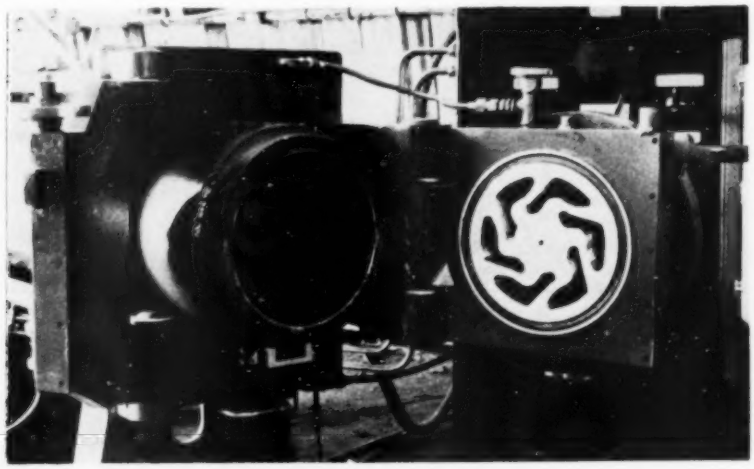
DISTRIBUTORS IN 43 COUNTRIES AROUND THE WORLD

Extruder for Batch Production

DEVELOPED BY BARWELL ENGINEERING

AN extruder for batch production has been developed recently by Barwell Engineering Ltd., Swavesey, Cambridge. This uses a hydraulic ram instead of a screw for forcing.

Pictured is the front end of the extrusion barrel which is 10in. i.d.



with the hinged head open. Various attachments have been developed for use in the head for producing different types of work; that shown is the attachment for producing tube up to 9in. od and sheet up to 28in. wide. Batch weights the machine can handle vary from 100-150lb. according to the specific gravity The power consumption is only a fraction of that required for the normal screw extruder and Barwell states that the temperatures of extrusions can be very much lower than with screw extruders, because of the small amount of energy absorbed by the compound during forcing.

The main ram has an auxiliary double acting ram within it for rapid approach and retraction and the time required for re-loading the extruder is very short. Pre-warming of a rubber compound can either be from a warm-up mill or from a warming chamber which Barwell has specially developed for this purpose.

The changing of dies can be done in 30secs. and the control of extrusion dimensions is achieved almost immediately after the start of the extrusion. The company says that as the temperature of operation can be very low, and can be adjusted to whatever is desired, very small extrusions can be produced, as well as large ones, without the fear of compound being scorched in the barrel.

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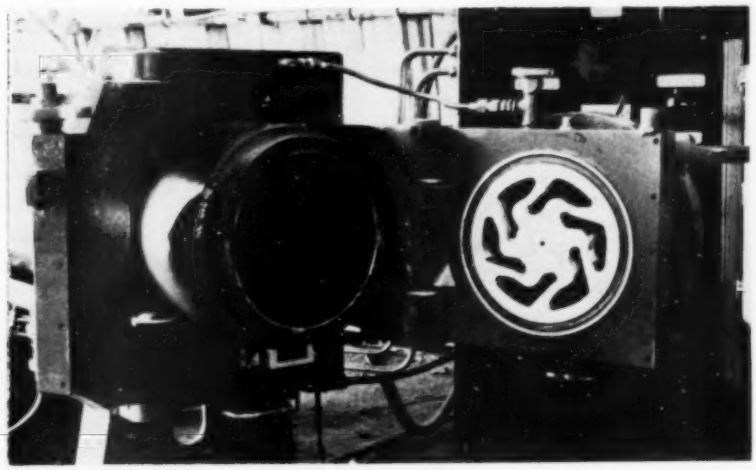

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Processing Variables in Premix Moulding*

COMPARISON BETWEEN HSI AND HARD CHROME GLASS

By HUGO DOOB, Jun., and T. E. PHILIPPS,
Owens Corning Fiberglas Corporation

THE technology of polyester premix moulding is a subject fraught with more than its share of controversy. Claims which are made concerning the properties of premix mouldings are, at times, difficult to substantiate, because they apply under one specific set of operating and testing conditions. They cannot be generalized.

The difficulty in making 'rules' for premix arises from the very nature of the moulding operation. Resin, finely suspended filler, and relatively enormously long reinforcing elements are forced, as a mass, to fill a complicated mould cavity almost instantaneously. The complex shape of the cavity, with all conceivable obstructions, produces a correspondingly complex, and only roughly predictable, flow pattern. The mass flowing in this pattern passes through a viscosity minimum with time. The resin first thins with rising temperature, and then thickens as it reacts, to form a gel and finally, solid at rest.

Interaction of Variables

The course of these complicated phenomena, and consequently, the mechanical properties of the moulding, are determined by elaborate interaction of all the variables of premix composition and preparation, the moulding variables, and the particular mould design at hand.

Separation of premix components during moulding can be minimized by proper compounding. Orientation of the reinforcing elements, however, and corresponding directionality of mechanical properties are almost unavoidable. Orientation of reinforcement may be compared to the troublesome molecular orientation in injection moulding of thermoplastics. It is responsible for much of the spread in physicals so frustrating to designers. Demonstrations of orientation can be seen in the interesting work on premix presented recently by White and Jackson.[1]

No single investigation can cover more than a small number of the premix variables, and these only in specific combination. It was therefore the objective of the following experiments to investigate only a few specific areas of premix moulding which have been of recent interest.

1. Comparison of flexural and impact strengths: high strand integrity vs. hard chrome glass reinforcement at several glass levels.
2. Comparison of tensile strength at knit lines: high strand integrity vs. hard chrome glass reinforcement.
3. Effect of mixing temperature and mixing time on mechanical properties of premix mouldings.
4. Effect of moisture content of premix ingredients on preparation of premix and mouldings therefrom.
5. Effect of part shape and minor variations in testing methods on mechanical properties of mouldings derived from a single batch of premix.

No sustained attempt was made to develop a maximum in any given mechanical property, or to develop any specific balance of properties suitable to a particular end use. The main objective was to demonstrate trends at reasonable levels of mechanical properties under reasonably well controlled operating conditions.

Flexural and Impact Strengths

The glass levels originally chosen for this comparison were 10, 20, 30, and 35% by weight, but it became apparent that the hard chrome glass could not be loaded higher than 30% without excessive mixing time. The comparison at the 35% level is therefore missing.

Mixing times indicated considerably faster wet out with high strand integrity glass than with hard chrome.

Moulding was carried out using a 14in. x 11in. x 4in., semi-positive, box mould, closed to stops at about 2,000psi. Moulded boxes were cooled on a wooden jig, and then sampled for flexural and notched Izod impact strength. Specimens were taken along the chords and radii of a circle, inscribed and centred on the bottom of the box to sample roughly parallel and normal to the direction of flow. The sides were also sampled in this way. Specimens taken were 14 per box, for flexural strength, and 18 for impact strength.

Results

The results are shown in Table 1. Flexural strength increased with glass content for both reinforcements, as would be expected. At 10 and 20% glass, the hard chrome averaged slightly higher than high strand integrity. The 1:1 blend showed no outstanding characteristic. At 30%, the high strand integrity glass give slightly higher strength and smaller range than the hard chrome. At 35% loading, the high strand integrity glass gave further increase in average strength. Impact strengths generally increased with increasing glass content, and hard chrome seemed to give slightly higher values than high strand integrity. The impact strengths at 30 and 35% high strand integrity glass were low, probably because of inadequate seal of the mould. Hard chrome glass, at the 30% level, gave a normal value,

TABLE 1
COMPARISON OF FLEXURAL AND IMPACT STRENGTHS

% Glass		10%			20%			30%		35%
Glass type		½in. 805 HSI	½in. 870 chopped spun roving	½in. 805 HSI	1 : 1 blend 805/870	½in. 870 chopped spun roving	½in. 805 HSI	½in. 870 chopped spun roving	½in. 805 HSI
Flexural strength (psi × 10^3)	high	10.9	15.2	24.5	21.2	21.1	27.9	28.5	27.8
	aver.	8.4	9.0	12.1	14.8	15.6	16.5	15.3	19.0
	low	6.7	6.7	7.4	9.0	8.4	9.6	5.5	11.6
Notched izod edge impact strength (ft.lb./in. notch)	high	3.4	5.9	4.9	5.1	5.4	6.0	8.0	6.4
	aver.	1.7	2.8	3.3	3.3	3.8	4.4	5.5	5.0
	low	1.0	1.4	1.9	1.5	1.8	2.3	2.8	3.7

*A condensed version of a paper presented at the 16th annual meeting of the Reinforced Plastics Division of the American Society of the Plastics Industry Inc., at Chicago in February 1961.

possibly because of greater resistance to flow.

Tensile Strengths at Knit Lines

The development of knit and flow lines in premix moulding constitutes one of the difficulties of the technology. Such lines are produced by parallel fusion, or alternately by collision of discrete streams of premix during mould closure. They are particularly troublesome in large, deep-drawn sections and have been responsible for high percentages of cracking failures during moulding. Knit and flow lines also degrade the appearance of the piece.

It was recognized relatively recently that mould cracking could be drastically reduced, and knit and flow lines made less prominent by substitution of high strand integrity glass for softer glasses in heavy duty premix.

Table 2
Comparison of Tensile Strengths

Glass type	10% ½in. 805 HSI	10% ½in. 870 chopped spun roving	20% ½in. 805 HSI	20% 1 : 1 blend 805/870	20% ½in. 870 chopped spun roving	30% ½in. 805 HSI	30% ½in. 870 chopped spun roving	35% ½in. 805 HSI
Tensile strength (psi × 10^3)	2.97 aver.	3.99 aver.	3.59 aver. 4.52*	6.27 aver.	3.84 aver.	4.90 aver.	4.41 aver.	5.71 aver.
Tensile strength at knit line (psi × 10^3)	2.45 aver.	1.62 aver.	2.94* aver.	2.30	2.36	2.48 aver.	1.94 aver.	2.63 aver.

*Sides of box; remaining data are from bottoms.

Table 2 shows actual measurements of tensile strengths at knit lines. The data in this table were obtained by (a) moulding boxes with single charges, and (b) with split charges, in which knit lines were produced.

In the absence of knit lines, firstly, there seems to be no consistent difference, and in one case, there was actually no statistical difference in tensiles, in comparing high strand integrity glass to hard chrome. At the knit lines, however, there is a definite trend for greater strength in the high strand integrity reinforced mouldings. Further testing volume is needed to establish its magnitude.

Mixing Temperature and Time

The effect of raising temperature in the mixing operation is primarily one of lowering the viscosity of the resin-filler paste and promoting wet out, particularly of the glass. Fast wet out and low shear tend to protect the glass during mixing, provided the size is not softened.

Two mixing time series were carried out on the same formulation: the first with an unheated mixer, in which the temperature of the mass rose between about 82°F. and 107°F. during 40 minutes of mixing, after addition of glass; the second with a heated mixer in which the temperature of the contents was held at 105-120°F. during 30 minutes of mixing after addition of glass.

The glass could be added in one minute at either temperature. Premix was sampled after measured time intervals, and portions extracted with acetone to leave the bare glass for inspection.

In both series, the fibre bundles began to filamentize after about five minutes; at this time, the temperature had risen to 90°F. in the unheated series, as compared to 105-120°F. in the heated. Heating the mix apparently did not protect the glass.

For a study of mixing time, the heated series was selected and moulded into boxes, and these tested for flexural and impact strength. Results are shown in Table 3. It can be seen that flexural strength began to decay after three minutes, and decayed progressively with continued mixing. Impact strength seemed to decay in roughly the same pattern.

Effect of Moisture

Isolated reports from the field mention operating benefits obtained by thorough pre-drying of fillers and reinforcements.

Comparison of mechanical properties in mouldings showed that slightly greater flexural strength, essentially equal tensile strength, and slightly lesser impact strength were produced with use of 'as is' ingredients when compared to the pre-dried. Thus, no significant effect of pre-drying on mechanical properties was demonstrated.

Moulding of the premix made from humidified ingredients showed extreme blistering, and what is more, separation of the premix components. Such effects might begin in an intermediate moisture range not covered by the experiments. It is conceivable that extremely humid climates could produce them.

Table 3
Effect of Mixing Time

Mixing time in minutes, including 1min. to add glass		3min.	5min.	8min.	13min.	30min.
Flexural strength (psi × 10^3)	high ..	22.9	26.9	24.3	20.6	16.7
	aver. ..	18.3	16.7	16.1	15.9	9.3
	low ..	13.0	8.0	9.3	9.3	7.7
Izod edge impact strength (ft.lb. in. notch)	high ..	8.8	6.9	5.8	5.0	3.3
	aver. ..	5.2	4.6	4.7	4.1	2.2
	low ..	3.4	2.7	2.9	2.2	0.9

Other Factors

The effect of part shape and variations in test methods were investigated by carrying out tests in different laboratories on different mouldings prepared from the same batch of premix. These experiments showed differences in mechanical properties when the moulding run was sampled and tested by different individuals and the development of considerable spread in mechanical data with relatively minor increase in mould complexity.

Tests were also carried out to compare the mechanical properties of mouldings made from premium grade and general purpose resins. These showed that the premium grade material gave greatly improved flexural strengths, slightly improved impact strength and comparable tensile figures.

REFERENCES

[1]White and Jackson, *Modern Plastics*, **36** (7), 117, (1959); **36** (9), 115, (1959).

Gedong Estate Offer

Consolidated Salak Rubber Estates Co. has made an offer for 979 acres of Gedong Rubber Estate Ltd., representing the greater part of that estate. The offer consists of £18,807 and the allotment of 560,000 shares of 2s. each of Consolidated Salak.

This 5-gallon blow-moulded polythene jerrican is the latest addition to the range of containers made by Casceloid of Leicester. A pouring device which can be inverted and carried inside is also available

LIFE INSURANCE

The life required of a finished product is an important guide to the type or quality of materials incorporated during fabrication. Thus, choice of an antioxidant depends on the type of article being manufactured and on the service conditions encountered. In many cases the average life of the article would not justify the use of the more expensive antioxidant. In other cases, the expectation of life or the service conditions demand the best product available.

Essentially, non-staining antioxidants are used in rubber articles for two reasons in addition to their protective influence:

(a) To retain the appearance of white or light coloured rubbers on exposure to light.

(b) To avoid the discoloration of other materials, such as rubbers, plastics, paints, etc., that are in contact with rubbers of any colour.

Many footwear compounds and some types of rubber toys are typical examples of applications where maximum life is not demanded, and where Nonox SP, NS and NSN from the Nonox range of antioxidants have proved adequate. Nonox SP and NS have also been used in latex products, including latex foam. In general, the ageing properties of latex foam articles are fairly good but they are also expected to last for many years. More efficient antioxidants would generally be recommended in this case.

A group of very similar antioxidants, differing chiefly in physical form, is comprised of Nonox EX, Nonox EXN and Nonox EXP. Of these, Nonox EXN is a little weaker and slightly more liable to stain than the other two. All three give good protection and are recommended for a wide variety of applications with the exception of latex goods. The principal uses lie in mechanical goods, including extruded goods. All three have been used successfully where migration staining to paints is a problem. Unexpected effects can, however, be encountered and each case where migration staining can occur should be examined separately.

Two other antioxidants in the group are of especial interest in that they are used with outstanding success in a wide range of latex articles. Particularly recommended for such uses is Nonox WSP, a highly efficient antioxidant normally retained for the more critical applications. Nonox WSL combines efficiency of the high order of the Nonox EX, EXN, EXP group with minimum staining. Although its use is not advised in rubbers that come into contact with PVC, it can be used to advantage in white tyre sidewalls.

Developed as an exceptionally powerful non-staining copper inhibitor—and as such particularly valuable for cable insulation, proofing and latex compounds—is Nonox CNS. This surpasses all the previously mentioned antioxidants where metal inhibition is required and is, in its own right—having the same order of efficiency as Nonox WSP—a very powerful conventional antioxidant.

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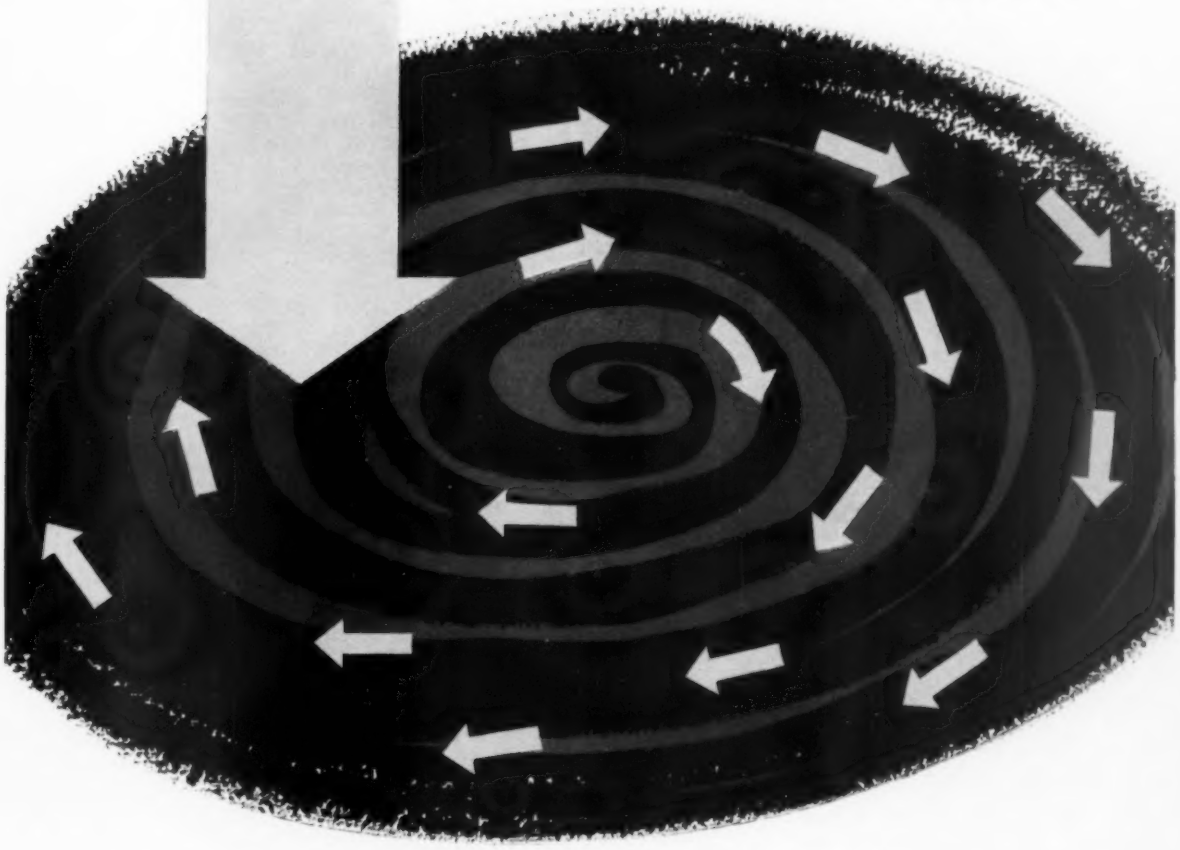

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C

Dynamic Properties of Rubber

SBAC COMMITTEE MEMBERS VISIT SHAWBURY

THE members of the Specifications Committee and Non-Metallic Materials Panel of the Society of British Aircraft Constructors visited the Shawbury laboratories of the Rubber and Plastics Research Association last month. The programme included a brief talk by Dr W. F. Watson, the Director of Research, in which he described the organization and functions of RAPRA, and lectures by several of the RAPRA staff.

Effects of Shape

A. R. Payne gave an illustrated lecture covering the more important aspects of the dynamic mechanical properties of vulcanized rubbers, both natural and synthetic.

His first major point was concerned with the effects of the shape of the test piece or product upon the measured stiffness. For example, for infinitesimal strains in metal, the compression load on a cylinder was proportional to the deformation and to the cross-sectional area, and inversely proportional to the height of the cylinder. This was still true for rubber if the ends of the cylinder were perfectly lubricated.

If, however, the ends were restricted so that they could not spread laterally, barrelling took place and the stiffness was a function of the height/diameter ratio of the cylinder. Whether the ends were free or constrained, finite deformations of the rubber were no longer proportional to the applied load. The necessary functional relationships had been found for cylinders, toroids and other simple shapes. The lecturer stressed the point that Poisson's ratio for rubber was about 0.5 and that the bulk modulus of the material was therefore very high in comparison with its other moduli, a fact which was frequently overlooked by designers.

Effective Parameters

Mr Payne then proceeded to discuss the various parameters which could modify the modulus and phase angle of a piece of rubber. A simple experiment with balls of three different types of rubber demonstrated that changing the temperature would rate the different rubbers in different order of co-efficient of restitution. He then described the application of the Williams, Landel and Ferry relationship between the effects of temperature and frequency upon the dynamic properties of rubbers, and explained that the relationship held for most rubbers and plastics.

It was stated that the effects of more combined sulphur, adding fillers or adding plasticizer might be simply described according to whether they (i) raised the level of the stiffness in the rubbery region, (ii) raised the level of the stiffness in the glossy region and/or (iii) altered the position of the rubber/glass transition on the frequency scale.

Test Amplitude

Another parameter which could modify the properties was the amplitude of the test oscillation. With a rubber containing a large proportion of carbon black, the modulus at very low amplitudes of deformation was very high and the phase angle nearly that of the pure gum rubber (very low).

As the amplitude was increased, there was a region over which neither of these properties changed markedly. In the region of 1% amplitude, the modulus fell with increasing amplitude and in this region the phase angle went through a maximum. At about 100% amplitude, the modulus had fallen to the values normally quoted by the technologist which might be only one-twentieth of the low amplitude modulus; the phase angle was somewhat below its peak value.

This behaviour did not imply non-linearity in an individual stress/strain relationship. At normal frequencies of deformation, the first cycle or two of high amplitude deformation were sufficient to change the state of the rubber from hard to soft and subsequently for at least a short time, the rubber would behave as if it had never been in the hard state. The stress/strain curve for a sample in shear was an ellipse in each case. On being tested the sample gradually recovered towards its initial stiffness at low amplitudes. Mr Payne demonstrated the apparatus used to determine the vibration transmissibility of rubber and made some observations on the results obtained.*

After this, the party split into sections for talks on one of three subjects. A. Eagles demonstrated the electronic tensile tester designed by RAPRA and showed its applicability to the measurements of tensile strength and modulus at high temperatures. The results of the tensile tests at various temperatures upon the properties of various types of rubber were shown in graphical form.

W. Fletcher described the development at RAPRA of an ozone test equipment and demonstrated the equipment. He also explained the method of grading the degrees of ozone cracking of the samples.

Stress Relaxation

Dr J. Scanlan then gave a talk on the significance of stress relaxation data in relation to the oxidation of rubber.

Dr Scanlan stated why stress relaxation measurements, in which the decay in tension in a strip at a constant stretched length was followed while the strip was heated in air, were useful in investigating ageing.

Dr Scanlan explained that measurements could be made in two ways, in one of which the strips were kept extended the whole time and in the other were normally unextended but stretched periodically for short lengths of time while the tension was measured. The two types of measurement did not always give similar results.

During ageing the degradation reactions were accompanied by the formation of new crosslinks. Crosslinks formed in a stretched strip were so formed that they were not under tension and did not contribute to the tension until the length was changed so that crosslinks formed during the ageing did not affect the continuous measurements in which the strip was always stretched, which therefore followed the degradation reaction. In the intermittent type of measurement, on the other hand, the strip was unstretched for by far the greater part of the time and the crosslinks then formed made their normal contribution to the tension on stretching so that the net result of degradation and crosslinking was determined. Use of both types of measurement enabled crosslink formation and the network breakdown reactions to be separately estimated.

*'*Engineering Design with Rubber' by A. R. Payne and J. R. Scott, published by Maclaren and Sons, Ltd. contains a fuller discussion of these points.*

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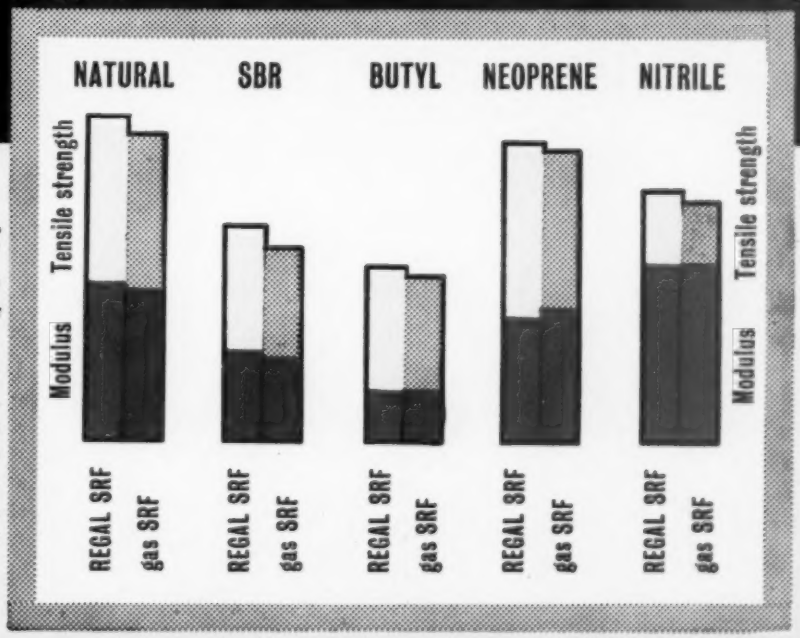

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PLASTICS MACHINERY DEVELOPMENTS

Automatic Trimmer for Plastics

FAWCETT PRESTON RANGE OF COMPRESSION AND TRANSFER PRESSES

By JOHN SHEARING

ONE of the quieter yet more interesting exhibits at the recent Interplas international plastics exhibition was the Perpheco automatic trimmer for plastics and rubber. It is marketed by M. Shelley Partners Ltd., and was developed in conjunction with Omega Plastics Ltd.

The basic principle of the machine is a turntable on which is placed a wooden master or pattern (with a metal runner) the same shape as the article to be trimmed and which is followed by a saw. It is particularly suitable for vacuum and drape formed articles and is designed to leave an accurate edge in a flat plane, however uneven or wrinkled the excess material.

Versatility

The Perpheco trimmer will accept forms with a maximum diameter of 36in. and a maximum difference between maximum and minimum diameters of 20in. The variable speed range of 1-12rpm also assists in versatility. All parts of the machine are interlocked to ensure operator safety and air failure locks the machine in the off position.

The worktable is horizontal and the work is held down by an overhead spindle which rests with its own adjustable weight on the work and is raised by compressed air. A sliding carriage on the upper deck of the machine carries a vertical sawspindle belt and the whole is urged towards the workhead (by a weight and chain) and the depth of cut is determined by a roller which contacts the lower part of the workform.

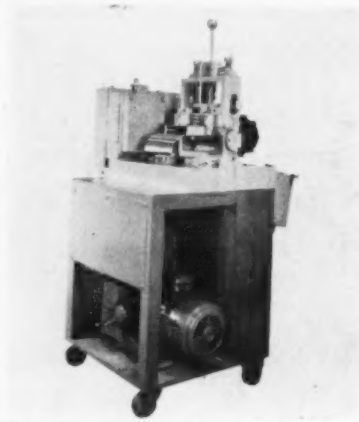
It should be stressed that the entire operation is automatic even for the largest sizes. Once the pattern has been placed in position and the machine set, unlimited unfinished articles are placed in position for trimming and left. The machine is ideally placed by the side of the moulding machine.

Burtonwood-Cumberland 6in. Pelletizer

The Burtonwood Engineering Co. Ltd. are producing a new small pelletizer in their wide range of dicing machines. Known as the Burtonwood-Cumberland 6in. Pelletizer, it is suitable for all small production operations and many laboratory uses as well.

One of the features of the machine is an overhung rotor with a removable cutter head. The latter is offered with eight or 12 individually attached knives, but a one-piece 'milling cutter' type head is also available with 24 cutting edges.

The head is mounted on a large heat-treated shaft, which rotates in permanently lubricated ball bearings.



The Burtonwood - Cumberland 6in. Pelletizer

The feed roll mechanism, a most important part of any pelletizer which insures constant and accurate feed, is a self-contained unit with both the upper and lower feed rolls driven through universal joints. It may be retracted for access and ease of cleaning.

This is a useful addition to the range of small machines.

Fawcett Transfer and Compression Presses

Fawcett Preston and Co. Ltd. may be said to have consolidated their range of compression and transfer presses for plastics. These range from 50 ton to 400 ton sizes and all are styled in the same way, being completely enclosed and streamlined.

All controls are centralized on one side of the machine, which is by push-button control, so that the machine is a compact, accessible and easily operated unit. However, the presses can be supplied by hand control if required, but all are complete with pressure gauges, pump, tank, piping, filters and relief and unloading valves, together with necessary timers and controls.

The table below summarizes some of the details of the Fawcett presses.

The presses are of the down-stroking four column type with fabricated presshead and base. The transfer cylinder and ram are situated below the base and are easily accessible. The ram is double acting and the change-over from compression/transfer to compression moulding is effected by the turn of a locked switch.

The presses have semi-automatic control with push-button operation to give one complete fast cycle. There are automatic pre-filling valves for fast approach with adjustable speed control up to 4in. per second.

In compression moulding there can be top or bottom mechanical ejectors or hydraulic ejection and in transfer moulding top or bottom mechanical ejectors. There is a slow down on tool approach, the position and speed being infinitely variable and there is a fine hand control for tool setting. The transfer ram speed is adjustable up to a maximum of 3in. per second, and the main ram and transfer ram pressure are adjustable by over 50%.

The moulding period is timed from an adjustable timer with 6min. as a maximum. The hot-plates can be either steam or electrically heated as required, with adjustable temperature control for each hot-plate.

This Fawcett range of presses is a fine example of modern design and development. The streamlining and ready access of controls with the semi-automatic features makes for a useful series of presses.

SPECIFICATIONS OF FAWCETT PRESSES

Press load (tons)	Stroke of main ram (inches)	Gross daylight (inches)	Hot plates (inches)	Drawback load (tons)	Transfer load (tons)	Transfer stroke (inches)
50	12	24	16 × 16	7	15	6
75	14	28	18 × 18	8	19	6
100	18	30	20 × 20	10	29	6
150	22	34	24 × 24	15	40	8
250	24	40	28 × 28	25	60	10
400	26	46	30 × 30	30	85	12

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The principals of Ro-Search, Inc. are the founders and former owners of ROMIKA SHOE FACTORIES in Germany. It is this same group of technicians and engineers who invented the process for producing slippers and casuals with direct vulcanised sponge rubber soles and also the direct vulcanising process for leather shoes (the original Rollman & Mayer "Paraflex" system).

This same group of footwear pioneers introduced the manufacture of vulcanised sponge-rubber soled footwear in Great Britain through technical know-how assistance provided to Pirelli, Ltd. Ro-Search, Inc. furnishes technical and commercial know-how to outstanding manufacturers throughout the free world.

In the U.S., Wellco Shoe Corporation, the largest producers of sponge rubber soled footwear in the western hemisphere, is the manufacturing division of Ro-Search. More direct-vulcanised footwear is manufactured the world over under original Ro-Search patents and technical assistance than with any other processes.

If you wish to learn how you can increase your profits in today's highly competitive markets, by also being able to offer your customers all types of leather slippers with direct vulcanised sponge-rubber soles, write to Ro-Search, Inc., Waynesville, N.C., U.S.A., or cable, or call us reversing charges, telephone Glendale 6–3545.

Our services are available in each country only to a limited, select number of manufacturers.

VIEWS and REVIEWS

Is Bigger Better?

WHAT do we need in order to increase our plant: practical trials or more basic technical knowledge?

There is a difference between multiplying and enlarging. The multiplication tables we learned at school are really enlargement tables. Three multiplied five times yields five threes; 15 is three enlarged five times. The difference is readily apparent in our industry, in fact, in the whole of the chemical industry.

If we wish to increase output, we have to make the difficult choice between enlarging and multiplying, and, in most chemical developments, multiplication is easier than enlargement, though, generally, less remunerative.

It may be that our process is a continuous one, and then enlargement is not often possible and we are compelled to multiply, that is to add another unit. But if we have a discontinuous or batch process, we find that it is usually cheaper, per unit of product, to make a new tank of twice the capacity.

Pilot Plants

The technical difficulty is that the factor by which the output is enlarged is not the factor by which all the process items are enlarged; some, in fact, remain unaltered.

Clearly, this problem of enlarging is most difficult in the first step of all — from laboratory to factory. What goes on in a large tank can be surprisingly different from what went on in a small test-tube.

An intelligent chemist will stand aside in awe and admiration at the courage of the chemical engineer who sets out to convert a few ccs. into hundreds of gallons, and, though dismayed, is not surprised when the first big batch 'sets solid' and has to be cut and chopped and sawn and finally burned out of the new tank during the weekend by a gang of non-technical workmen.

Therefore, says the wise man, why not go part of the way only, why not have a pilot plant? To that simple question, Howard F. Rase of the University of Texas, devotes an article on pp. 39A and 40A of *I/EC*, Vol. 53, No. 5, for May 1961.

He regards the pilot plant as an analogue and defends analogic thinking and experimentation as a logical constituent of the scientific method. 'The pilot plant is only convenient when it represents a good analogy and when other forms of reasoning cannot lead to reasonably accurate conclusions'. That is simple enough to be almost platitudinous.

He goes on to summarize the advantages and the limitations of pilot plants, which I may briefly list in my own words.

Advantages

Simulates actual operation.

Much nearer to mass production than the laboratory method.

Yields practical experience of factors not apparent in laboratory work.

Can provide working data for larger plants.

Can sort out the really practical idea, quickly and cheaply.

Saves much time and money compared with theoretical analysis and long-term, bench-scale experiments.

Limitations

Pilot plant studies are costly.

They give but little insight into the fundamentals of processes. This may even retard the final stages of development.

There are still technical difficulties in enlarging to the next higher size.

'Pilot plants are self-perpetuating. Once built, at great cost, the tendency is to keep them operating'.

Conclusions

'Pilot plants will continue to serve as powerful tools as long as engineers deal in problems well in the frontiers of knowledge. Their use, however, must be clearly defined. The self-perpetuating attribute of pilot plants causes them to be operated long after their usefulness has been exhausted. . . . Perhaps the best safeguard . . . is simultaneous basic studies of important variables known to converge on the problem. . . .'

And that, I am sorry to say, is where we all came in; we have had a nice walk round but are back home again.

Nylon to the Rescue

In *Skinner's Silk and Rayon Record* for May 1961, pp. 427-8, Dr R. L. Wormell suggests a new process for preventing the felting of wool — and, hence, the shrinking of woollen garments and fabrics. It amounts to employing a competitor, nylon, to overcome wool's greatest disadvantage.

Felting is chiefly caused by friction between fibres, animal hair being especially prone to it because the hairs have a rough outside structure consisting of orientated scales. The felting can be overcome if this structure can be covered, sheathed.

An early method of doing this was by a kind of graft polymerization which, though successful in preventing felting, brought about by a harshness which was quite unacceptable in most uses of wool.

Nylon Overcoat

A new method, proved in the laboratory but awaiting factory scale use, is to soak the wool in a cold, aqueous solution of hexamethylene diamine, which, being mildly alkaline, readily penetrates into the fibres. Surplus diamine is removed by washing in a detergent, and the swollen fibres are then transferred to a bath containing a 1-2% solution of sebacyl chloride in paraffin.

The effect is, of course, to form a nylon which is deposited just where it is wanted — on the surface of the wool fibres. The paraffin does not penetrate into the alkali-swollen interior so that only a surface layer of nylon is formed.

The coated fibres are now washed in an aqueous solution of a detergent which removes any paraffin as an emulsion.

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

The nylon coating weighs about 2% and costs about 10s. per lb. which is not expensive as it prevents the loss by felting of the expensive work already expended in the operations of scouring, gilling, carding, combing, drafting, twisting, weaving, or knitting.

Understanding Accelerators

A pretty piece of research by J. Fayolle and R. Chasset of the Institut Français du Caoutchouc is reported on pp. 787-798 of *Revue Generale du Caoutchouc* for May 1961, Vol. 38, No. 5.

The work consisted in measuring the changes in low-frequency dielectric absorption and DC conductivity of natural rubber mixes during heating. I call it pretty because it has a certain aesthetic appeal brought about by its neat, logical progression from simple mixes of rubber with a single addition, with two, with three, and so on, ingredients, to its ultimate aim of sulphur-containing and sulphurless vulcanizing mixes.

A vulcanizing mix showed relatively high values at the start of heating, suggesting that ionic reactions were occurring. Later, absorption and conductivity values decreased because, it is argued, of consumption of ions and of lower ionic mobility in the cross-linked network.

Perhaps the most interesting part of the work was the effects given by various accelerators and vulcanizing systems.

First, the authors show that it is the presence of zinc oxide and stearic acid which provides the ions, or at least plays a major part in their generation. The use of up to 0.3% of tetramethylthiuram disulphide did not greatly influence this reaction, but diphenyl guanidine did.

They studied several accelerators and vulcanizing systems. They found striking differences between TMTD, ZDC, and DPG. Vulcanizing with dicumyl peroxide in the presence of zinc oxide and stearic acid gave no change in conductivity but a slow decrease in dielectric absorption, which leads them to argue that ions are reduced in mobility by the growing network and that in sulphur-containing systems, ions are actually consumed.

An Infant Reaches Maturity

Scott Bader and Co. Ltd. have just published their *Polyester Handbook*, and it seems to me such an excellent and useful publication that I would like to outline its contents.

This is the fifth edition since it was first published in 1953, and it has during that time grown into a sizeable book of 15 chapters, five appendices, and an index, in its 130 pages of text, with, in addition, over 70 photographic plates. The whole forms an eminently practical handbook for the maker of GRP products.

It is in four main parts: introductory, raw materials, processes, and properties.

The first two chapters review the whole subject and then deal with the chemistry of the unsaturated polyester resins, their manufacture and curing agents. Chapter 3 deals in more detail with curing, catalysts, accelerators, factors affecting setting time, exothermal effects, and post-cure changes.

Chapter 4 describes the reinforcers, glass fibre, woven glass cloth, chopped strand mat, rovings, needleloom mat, and so on, and refers to reinforcers other than glass fibres.

The Scott Bader products, 'Crystic' resins and others, curing agents, release agents, etc., and the characteristics of the chief resins in considerable detail are given in chapter 5. Chapter 6, Ancillary Products, is concerned with thixotrophy and means for achieving and controlling it, pigments, fillers, fire-proofing additives, and plasticizers. Mould release agents are described in chapter 7.

Fabricating Methods

Chapters 8 to 14 are the processing section of the book. Chapter 8 describes how to secure a satisfactory 'gel-coat', *i.e.*, an outer surface which is relatively rich in resin and is mainly intended to prevent the glass fibres becoming exposed. In chapter 9 are described the several methods of fabricating, such as contact moulding, spraying, flexible bag methods, vacuum and the related injection method, die moulding, and dough moulding. Continuous and semi-continuous processes are also described.

Chapter 10 is also a practical one, giving detailed instructions on making specific products such as boat hulls, vehicle bodies, transparent and decorative sheeting, pipes, rods, profiles, and miscellaneous castings.

'Glass fibre reinforced plastics can only be used to best advantage if the fabricator is prepared to design for the material'. This is the first sentence of chapter 11, 'Design Considerations', and this implies that the designer must know pre-eminently the characteristics of the material. Therefore, the chapter is mainly concerned with mechanical properties, and the strength of structures, joints and laminates.

The Trend from Merely Promotional

Workshop control of quality, and the causes and remedies for defects are set out in chapters 12 and 13, while the subjects of chapter 14 are Trimming, Machining, and Repairing. The last chapter gives the physical, mechanical, and chemical properties of GRP.

I think the appendices are useful. Appendix 3 gives lists of suppliers of materials and equipment. Other appendices are a Glossary of Terms, and a Bibliography consisting of a list of books on the subject and of journals carrying articles and papers on the polyester resins.

The well-reproduced photographs illustrating the book are on aircraft, boats, building, road transport, industrial products and models, and also depict different types of glass fibre reinforcements, and the process of contact moulding.

The publication, by a manufacturer of the resins, of such a practical handbook underlines the contention in its preface that 'an infant industry has at last reached maturity' and is an example of the modern trend away from merely 'promotional' literature to useful, practical manuals.

CHARLES JENNINGS

GRP in Space

FILAMENT WINDING PROMISING AREA OF STUDY

PROBABLY the most widely reported use of GRP in USA space operations is in the manned Mercury capsule which has carried two Americans more than 100 miles into space and is expected sooner or later to transport an astronaut into orbit and back to earth. GRP makes up the capsule's shield against overheating from the friction occurring upon re-entry into the earth's atmosphere, and the astronaut rides on a specially constructed couch of GRP and rubber.

Increasing the MI

The material occurs again in the Orbiting Solar Observatory of the United States National Aeronautics and Space Administration, in the form of three nitrogen bottles located on special extensions of the 350lb. satellite. Gas in the bottles is directed back to the wheel or main body of the craft to ensure the desired degree of gyroscopic stability by increasing the wheel's moment of inertia.

Honeycomb Filler

GRP likewise appears in the battery shell of the 500lb. satellite, Courier, which is now in orbit, and in two other shells, loaded with honeycomb filler, making up the main body of the 265lb. Transit, an experimental navigation satellite orbited last year by the United States Navy. Transit also uses GRP in a tube connecting compartments and is insulated against excessive temperature changes by a combination of fibrous glass and aluminium foil.

Another honeycomb structure, of phenolic-glass fibre composition, has been successfully tested in anticipation of the possible impact of meteoroids on the walls of manned space vehicles, which would involve risk of puncture and consequent failure of the craft. The honeycomb was practically unpenetrated by pellets in dynamic tests of its strength.

Filament Winding

Better exploitation of the special characteristics of glass fibre for the purposes of space craft is constantly being sought in extensive research programmes, by makers not only of the glass but also of rockets and missiles. Considered to be the most promising area now under study is filament-winding, which has been developing for the past four years. Products of this process, such as motor cases and pressure vessels, are characterized particularly by light weight combined with strength, high temperature resistance and high modulus of elasticity.

High STW Ratio

Filament-wound products are expected in the near future which will possess a higher strength-to-weight ratio than is possible with any other structural material known. And such products in actual use in the recent past have already given an excellent account of themselves under heavy test.

Four Times Lighter Than Steel

Filament-winding starts with the spinning of up to 180 glass fibres of extreme fineness, far greater than that of human hair. The strands are then wound around a mandrel. The glass is bonded with a resin, and after cure the mandrel is discarded. Parts made in this way are stronger, lighter and cheaper to produce than their equivalent in aluminium or titanium, and titanium cases are four times lighter than those of steel.

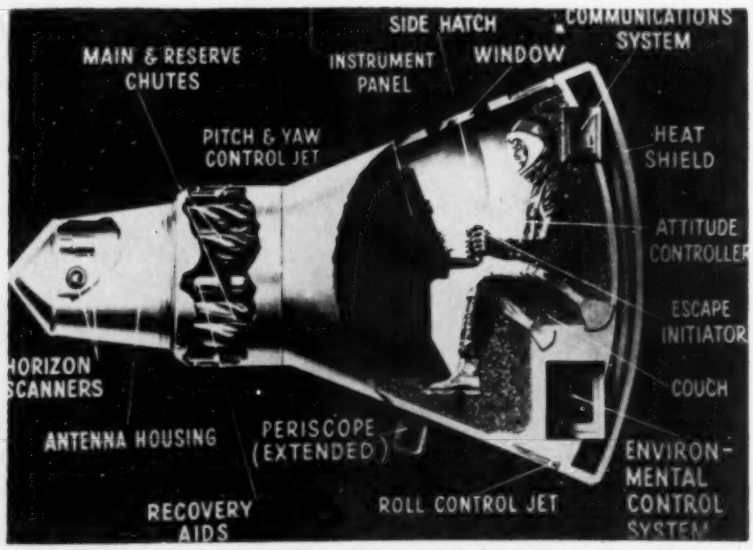
Using glass-epoxy systems, filament-wound parts have been created with unidirectional tensile strength up to 230,000psi at room temperature. Filament-wound cases are less stiff and buckle-proof than titanium cases, but work on this problem is under way, with encouraging results.

From Earth to Moon

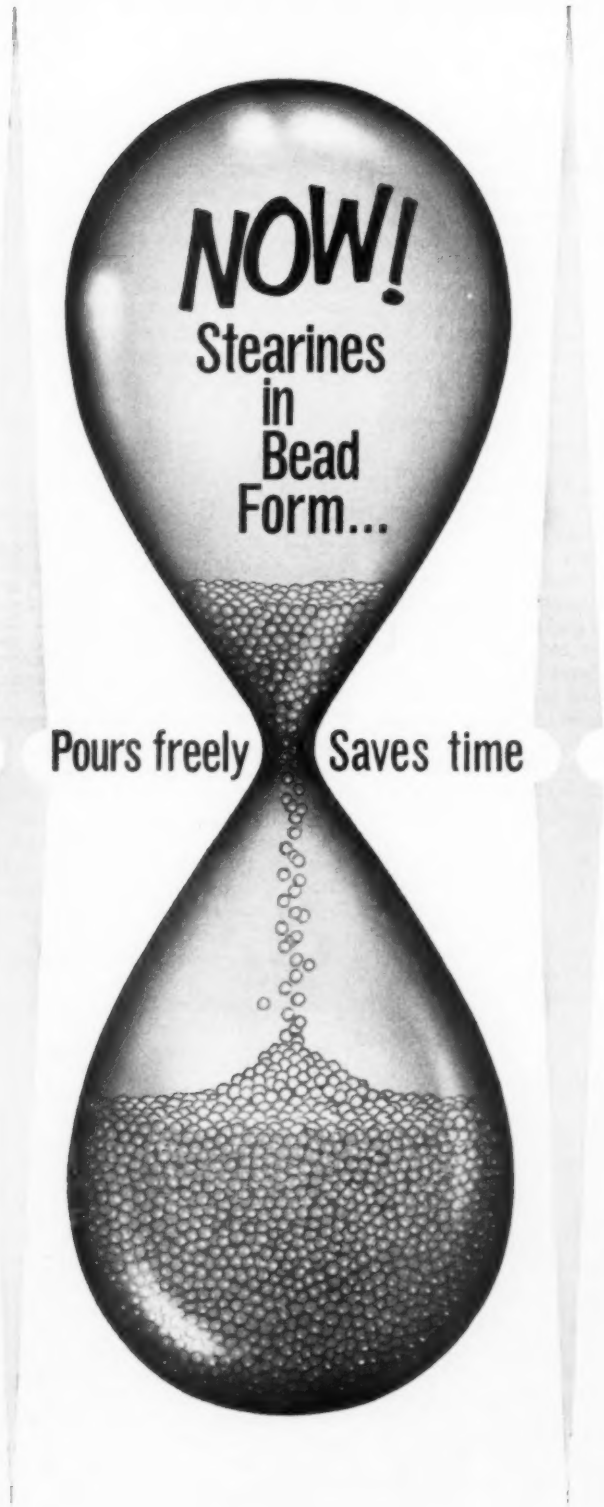
Filament-winding consumes large amounts of glass. Motor cases now being developed for the first-stage rockets of two US missile types call for some 800lb. of glass fibre each. A second-stage motor case used in the A-2 Polaris contains 268,000 miles of glass roving — stretched out end-to-end it would reach from the earth to the moon. The Minuteman third-stage case contains 188,604 miles of glass filament.

Developing Needs

Other research is being directed at finding not only resins which are more heat-resistant than those now available but also new kinds of glass to meet developing needs. Owens-Corning Fiberglas Corp., for instance, has produced new basic glass fibres imparting greater strength to composite structures (in co-operation with the Navy Bureau of Aeronautics, Airborne Equipment Division, and the United States Air Force Materials Center) and a high-modulus glass (YM31A) which is said to deliver a modulus (rigidity) as much as 45% greater than standard 'E' glass, without loss of strength, when used unidirectionally in a composite structure.



In the Project Mercury capsule, which carried the first two Americans into space, reinforced plastics provide both outer heat shield at rear and the couch in which astronaut rides



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MEN and MATTERS

A Review of People and Events

by Peter Richards

MENTIONING Hong Kong is not the best opening gambit in a conversation with some UK manufacturers. But considering the statistics just as statistics, it never fails to amaze me just how much such a small place can produce.

For example, according to the *Hong Kong Trade Bulletin*, the value of exports of locally produced plastics flowers, fruit and foliage, amounted to nearly HK$150m. (We took $21m. worth, while America absorbed five times as much.)

The growth of this industry has been phenomenal. The 1960 exports were worth 140% more than those for 1959, 800% more than 1958 and no less than 4,000% more than 1957, when several other items were also included under a composite heading. There are currently 239 factories listed with the Commerce and Industry Department as engaged in the manufacture of plastics flowers and many of these have been established recently to cope with the flood of orders.

Attempt at Scent

The most important development last year, I understood, was the increasing use of pvc — but there were also attempts to spray the flowers with scent. The smell was guaranteed to last for three months, but does not appear to have worked particularly well. Now the scent is incorporated into the mix before moulding, and this seems to give better results.

The Hong Kong manufacturers seem to have studied their botany books closely, producing exotic lines like mangoes and lychees, as well as the more usual fruits. The manufacturers cannot even be met any longer with the sophisticated cry: 'They're too perfect!'

Because now they even make bananas with bruises on.

Around the World 40 Times

Few people can claim to have travelled a million miles by air, but one who has well exceeded this distance is Lord Baillieu, president of the Dunlop Rubber Co. and chairman of the English-Speaking Union.

This achievement was marked at the Savoy Hotel on Wednesday (August 9), when G. W. Armstrong, European director of United Airlines Inc., made a triple presentation to Lord Baillieu, and to Lady Baillieu and Miss L. E. Watson, his personal assistant, who have also completed a million flying miles.

Lord Baillieu, who was born in Melbourne, first took to the air 50 years ago when he had his initial flight with M. Zullerot, head of the Bristol Flying School. The aeroplane was of the early 'string box' variety, and the event was anxiously witnessed by his fiancée, now Lady Baillieu.

'The thrill of the first flight,' says Lord Baillieu, 'still lives for my wife as for myself. I confess that I was for a moment a little concerned when Zullerot took my fiancée, as she was then, much further out and flew for a much longer time than he did with me!'

Lord Baillieu recalled one man in particular that he met during his early flying days; a fellow Australian, the late Wing Commander 'Ossie' Watt, who took the first Australian Fighter Squadron of Sopwith Pups to France, and later formed and commanded the first Australian Wing. He was one of the earliest flyers, and Lord Baillieu recalls that on a particular occasion only the compass in the instrument panel of the 'plane being flown by 'Ossie' Watt was working. When Lord Baillieu commented on this after landing, Watt replied 'Oh, I've never taken to the new-fangled aids, so I cut them out of my machine'.

During the First World War Lord Baillieu served with the Australian Imperial Forces, and the Royal Air Force.

When flying, Lord Baillieu passes the time reading anything from 'Whiskey Galore' to a biography, and Lady Baillieu, who is very interested in tapestry, has completed quite a few on her journeys. It is usually a less relaxing time for Miss Watson, whose reading is largely confined to timetables and itinerary arrangements!

Dr F. C. Lloyd has joined F. W. Berk and Co. Ltd., chemical manufacturers, in the position of development director, although not a member of the main board. He was formerly research manager of B.X. Plastics Ltd.

No Twitching Required

The oddest application I have come across recently was pointed out to me by a friend in America. He told me about some cows that do not need to twitch their tails.

They wear a new harness that evenly distributes insecticide over vulnerable areas, and so keeps the flies away.

The 'business end' of each harness consists of two flexible tubes made

Lord Baillieu, president of the Dunlop Rubber Co. Ltd., Lady Baillieu, and Miss L. E. Watson, holding the plaques presented to them by G. W. Armstrong, European director of United Airlines Inc., to commemorate having travelled over one million miles by air. (*See: Around the World 40 Times*)

from Geon vinyl, filled with insecticide and supported along the animal's back by straps. Wicks that can be shortened to any required length hang freely from the tubes and distribute the insecticide, at a regulated flow, over the cow's body.

My friend comments that in this odd application plastics help to increase the cow's milk yield by 20% — and it also lifts the steaks into the expense account class, as beef cattle put on an extra 1lb. in weight a day.

Disposal Fever

As fast as the American father buys a new car (and judging by one description of the American economy, this seems to happen every six months) his small son is impelled to turn out

his toy cupboard and replace his 'autos'.

To cater for this disposal fever one firm is producing new lines of scale model toy cars; the ones shown here, for example, exactly duplicate the 1961 Chevrolet line.

Scaled to 1/25 actual size, the miniature cars are precision moulded from Cycolac ABS polymer to reproduce the smallest details, right down to the notches on the steering wheel.

Quick on the Delivery

These days delivery is becoming almost as important as the commodity itself. Vitafoam Ltd. has developed an improved quality rubber carpet underlay and is coupling it with 'a new express service to retailers at the Manchester BFM Exhibition'.

The new Vitalay underlay has a dark blue hessian backing which is marked in yard and half yard lengths to facilitate measuring.

Stocks held in London and Manchester will make a 24-hour delivery service possible in those areas. To other areas orders will be despatched within 24 hours.

Export Response

A company that has responded to the call for more exports is E. K. Cole Ltd. It has formed a new subsidiary company — Ekco Export Ltd. This will handle the export of radio, television and car radio receivers, electric heating and plastics products produced by the Ekco Group and will be responsible for maintaining and expanding overseas manufacturing arrangements.

T. C. Cleveland, formerly export manager of E. K. Cole Ltd. is director and general manager of Ekco Export Ltd. He has been with the Ekco export department since 1934.

Other directors are W. M. York (chairman), J. Corbishley, and D. J. Cole.

Bootnote

The crews of the Royal research ships *John Biscoe* and *Shackleton*, which sail for the Antarctic early in September, have been fitted out with Dunlop boots. The two ships will be sailing from Southampton to the Falkland Island Dependencies with a relief team of scientists who will carry out research on the Antarctic ice cap.

2 — 'Reclaimed Rubber'

THE LEGAL ANGLE

Coming to a Nuisance

By a Barrister

'If you use your property in such a way as to deprive your neighbour of the reasonable enjoyment of his property, you are guilty of a nuisance' (*RPW*, August 12 1961).

Last week we considered the possible nuisance to neighbours caused by manufacturers building plants near them. Now suppose that you have been happily turning out rubber products for some time, to the accompaniment of loud noises, pungent odours and a great deal of smoke and smut. No one complained because no one lived near you. And then along came a developer and built a new estate.

Would its occupiers have any rights against you, or would it be a defence that they 'came to the nuisance?' And, if they had any remedy, what would it be? What could they do to you, if they could prove a nuisance against you?

Unfortunately for you, it was long ago established that the fact that you have been using your land in such a way as to create a nuisance for some time before the complainant came within range of your unpleasant activity, does not free you from liability. If the emanations from your plant are unreasonable, going beyond the ordinary give and take of neighbourly living, you will have to mend your ways.

'What happens otherwise?'

You will be sued. And the Court can make two kinds of order. First, it can grant an injunction — an order, restraining you from behaving in the way complained of.

'And if the order is disobeyed?'

You are guilty of a contempt of court. And the court may award damages to your neighbour, to compensate him for the unpleasantness which your behaviour has caused to him. And they may also be punitive, to teach you a lesson.

So the answer is that you must do your very best to carry out your operations so as to cause the least possible disturbance to your neighbours. You must plan new plants so that they are in areas where residents must expect noise, smells or industrial effluent, as the case may be, rather than in residential areas where industrial activity is likely to cause upsets.

Alternatively, you must see that there is a sufficient area of land around your premises which you yourself own, so that you can keep it clear of potential objectors. And if you do not, what is a nuisance to them may prove even more of a nuisance to you!

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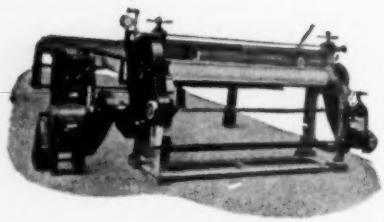

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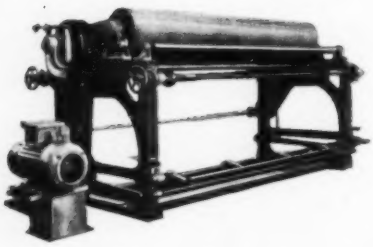

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The Challenge to Natural Rubber

'PROGRESSIVE PRODUCERS CAN FACE THE FUTURE WITH CONFIDENCE'

IN his introduction to the 23rd annual report of the Natural Rubber Producers Research Association, Dr L. Bateman, director of research, refers to the changes which may take place in the near future in the balance between natural and the newer synthetic rubbers.

The premium position at present held by natural rubber, he says, is determined, first, by the ever-increasing overall demand for all rubbers, which, temporary set-backs apart, shows no signs of slackening, and, secondly, by its hitherto unique combination of technical qualities which renders it essential for certain important applications and favoured for many others.

This position is likely to persist for a few years, but only for a few years, since the second factor has been undermined by the development of synthetic *cis*-1:4-polyisoprene and *cis*-1:4-polybutadiene. The full commercial impact of these new synthetic rubbers is not immediately at hand, but, the report says, it is evident that the natural rubber industry must prepare to face a competitive situation of a different kind to that experienced so far.

Agronomic Advances

Progressive producers, large or small, can face this prospect with confidence for several reasons. First, modern production methods already ensure that natural rubber can be marketed profitably at a price fully competitive with that of any synthetic substitute. Further agronomic advances, foreshadowed by research results now available, will be of the greatest importance in consolidating this strong and obviously crucial advantage.

Secondly, the report adds, no synthetic having overall technical superiority to natural rubber has yet been made or is in sight — 'as the massive effort directed to artificially reproducing its properties so pointedly reflects'.

Thirdly, improvements continue to be made so that natural rubber compositions can meet changing and often more stringent technical demands in processing, properties, and economy. SP rubbers and improved heat-ageing and anti-cracking formulations are examples given, and the blending of natural rubber with synthetic rubbers offers new possibilities in this sense which will attract much attention to the mutual benefit of both materials.

Biological Research

Fourthly, and of the greatest significance, the report says, there is a field of research with quite new knowledge to be gained that is not out-matched in potential by any step forward envisaged for the synthetic rubber industry. This field is expressed by posing the question: 'How does a rubber tree produce its rubber and why of two rubber trees does one yield many more times than the other?' Given optimum climatic, soil, manurial and such-like factors, control of rubber production in the tree is as yet wholly genetic, but first clues to the chemical mechanism have recently been discovered, as outlined in the first of the following sections, and these open the way to further biological and chemical findings that could profoundly influence the production industry.

The report points to a growing realization that account must be taken of the pattern set by competitors in stimulating closer contacts and better understanding between producer and consumer. What met the case for marketing practices and for promoting consumer acceptance when natural rubber was virtually the only rubber can surely not be expected to satisfy the radically changed conditions of today, the report says. It adds that NR's experience of technical service, limited though this is, is certainly enough to reveal clearly the need for this more positive approach to the rubber user.

With output in Malaya due to double within ten years, the industry there is very much concerned with these considerations and with looking and planning forward. For some other producers and for certain accessory segments of the natural rubber industry, however, the report thinks the wind of change seems barely to be stirring and to these the new way ahead is likely to prove hard.

Electron Microscopy

Among the technological studies which have been carried out during the year by NRPRA, work with the electron microscope into the fine structure of latex vessels and their contents has shown that the vessels in young seedlings still retain many of the features of a typical living plant cell.

Investigations have established that the 5-carbon compound isopentenyl pyrophosphate (IPP) is the immediate precursor of rubber hydrocarbon in Hevea — and probably all other rubber producing plants. The radiotracer technique has shown that IPP is converted into rubber with extreme rapidity in fresh latex. The conversion is sufficiently high to demonstrate that only a few % of the IPP, at most, is involved in side-reactions such as the formation of plant sterols.

Ageing Studies

Studies of the autoxidation of the model terpene, squalene, in the presence of simple sulphur compounds continue to lead to improved understanding of how the sulphur groupings in rubber vulcanizates influence the ageing properties. It is now clear that certain of these sulphur compounds are powerful oxidation inhibitors, though acting in a quite different manner than conventional oxidation inhibitors such as phenols and amines. The latter repress autoxidation by removing intermediate peroxy radicals, but the former interfere with the decomposition of the hydroperoxide which normally is the primary source of such radicals. The novel mode of action is not yet fully understood, but work to this end is in progress and its exploitation is being explored.

Stress Relaxation

The ageing of natural rubber vulcanizates has been studied directly by measurements of continuous and intermittent stress relaxation and oxygen absorption, coupled with changes in the stress-strain properties of the aged vulcanizates.

Two extreme types of ageing behaviour have been recognized. One is characteristic of peroxide and 'sulphurless' tetramethylthiuram disulphide (TMT) vulcanizates; the other of unaccelerated and Santocure accelerated sulphur vulcanizates. The former vulcanizates degrade autocatalytically in oxygen by random scission of the main polyisoprene chain, are well protected by conventional inhibitors and dithiocarbamates, show little cross-linking during ageing, and do not degrade *in vacuo*. The latter vulcanizates degrade in oxygen by scission of the main chains near the cross-link, are protected by conventional inhibitors, but not by

Continued on page 301

First Round the Island

GRP KEELBOATS IMPRESS AT COWES

IN the *Yachting World* Keelboat class, several boats with glass reinforced plastics hulls performed very impressively during Cowes week. The Bristol I, sailed by Jack Knights, won the Roman Gold Bowl from some 270 contestants in the Round-the-Island race and performed outstandingly well in the other races for which she was entered. Other GRP boats in the hands of less expert helmsmen performed well enough for the handicapping arrangements to be criticised by those not so successful.

Bristol I was designed by Jack Holt and developed by Bristol Aeroplane Plastics Ltd. Built from British Resin Products Ltd. Cellobond polyester resin, she is a 30ft. double chine keelboat rigged with a fully battened mainsail and a Genoa. A cambered foredeck provides sitting headroom below, thus saving the cost of a coach roof, and the hull and upper deck are bonded to form a shell with built-in corrosion resistance and complete immunity from marine borers and extreme weather conditions. The surface of the upper deck is layed up in a textured mould to provide a non-slip surface as an integral part of the structure.

GRP Mould

The mould-tool for the hull is manufactured by Bristol Aeroplane Plastics Ltd. from glass-cloth and polyester resin. This provides a long-life mould which imparts a high-class finish to the end product.

In laying-up the shell, strong emphasis has been placed on three important factors—strength, rigidity and weight saving. The hog and beams of the Bristol I hull are of mahogany with closely spaced ribs to fore and aft in polystyrene buoyant foam. These are wrapped in glass-cloth and bonded to the skin, which is formed by an application of gel coat and laminations of glass-fibre mat, woven glass-cloth and glass-cloth tissue.

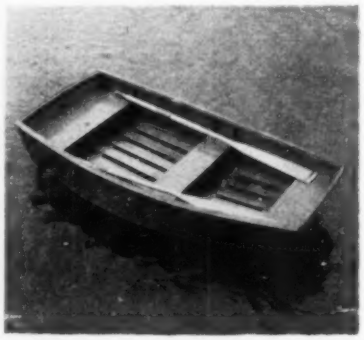
The hull and deck are then bonded to form a complete one-piece structure, which is subjected to a period of curing at ambient temperature before final removal from the mould tool.

A brief period of oven curing then completes the laying-up process, and the hull is fitted fore and aft with polystyrene foam slabs to give added buoyancy.

Pram Dinghy

Following the introduction some months ago of a pvc fishing punt, an 8ft. pram dinghy has been constructed from Geon RA173 high impact pvc by R. Giddins and Son, Hemingford Grey. The principle of construction is simple. A framework of preformed pvc sections is cemented into shape and covered in single pvc sheets cut to size: before the seat compartment is covered, special buoyancy sections are built in.

The framework is built from sections produced by Extrudex Ltd. Solid injection moulded corners are used for standard spigot and socket joints while the rest of the framework is in hollow extruded sections. These are secured throughout by solvent welding adhesives and nowhere in the construction of the dinghy is it necessary to use nails or screws. The exterior of the framework is clad in sheets of high impact pvc supplied by Telcon Plastics Ltd.



Pram dinghy made entirely from Geon high-impact pvc sheeting welded to a framework built up from extruded pvc sections

Boats built in this way can, of course, be fitted with all normal accessories, with special fittings to order. The small boat builder can construct a boat like this in approximately one day. The use of preformed sections for the framework cuts construction work to a minimum, so that the boat builders' tasks consist mainly of jointing and cementing the hull ribs, cutting sheets to size and welding them to the rib framework, building in the expanded buoyancy sections and fitting with accessories according to requirements.

The hull is extremely durable and it does not need painting or any other form of maintenance — a boat may safely be left out of doors during the winter with little effect. When muddied or dirtied it may quickly be rinsed down and cleaned with an ordinary chamois leather. It is also expected to have a considerably longer life than boats in conventional materials.

Bristol I under full sail off Cowes. The hull and upper decking are moulded from BRP Cellobond polyester resin reinforced with glass fibre by Bristol Aeroplane Plastics Ltd.

Plantation Newsletter

'RUBBER BUSINESS SHOULD NOT BE A GAMBLE'

by our Malayan Correspondent

FROM KUALA LUMPUR

MALAYA is to make it easier for India to buy natural rubber to meet the demands of her expanding industries. This move is to counteract the threat of synthetic which India expects to be producing in large quantities from next year.

Details of this scheme are now being worked out here by the Ministry of Commerce and Industry and it is learned that Malaya is considering allowing India to pay for her purchases in rupees instead of sterling as at present.

India, which buys more than half her rubber needs from Malaya, has said that she cannot increase this quota because of currency restrictions. She suggested that the sale of Malayan rubber would get a big boost if the Federation would enter into a barter agreement, or alternatively, agree to accept Indian rupees.

Last year Malaya sold 23,195 tons of natural rubber to India compared with 1,000 tons in 1950. India which grows between 5,000 and 7,000 tons, now requires 43,000 tons a year and this figure is expanding.

However, today producers here are worried about a joint American-Indian synthetic plant now being built at Bareilly, in northern India. When it begins production next year this plant is reported to be able to produce 30,000 tons a year. This firm is backed by Firestone.

In October, a top-level Malayan trade mission, led by the Minister of Commerce and Industry, Inche Mohamed Khir Johari, will visit India for ten days. Their talks will be mainly concerned with rubber.

One of the points which is likely to be stressed is that the Indian government and industrialists must realize that rubber imported from Singapore need not necessarily be genuine Malayan rubber.

In the meanwhile, Japan has indicated that it will buy more rubber from Malaya if prices are fair and the quality first-class. This was stated by Takeaki Kaneda, vice-president of Kaneda and Co. Ltd., one of the biggest rubber importers in Japan.

After investigating the rubber market here and in Thailand, Mr Kaneda said there must be no more 'monkey business' or fooling around in dealing with rubber now, because of the competition from synthetic.

He made it clear that the rubber business should not be a gamble, and 'rubber men' in Singapore and Malaya must devise a new approach in their business methods, possibly by introducing an arbitration system as in Japan.

Mr Kaneda said that in time Japan may be the only country to buy rubber from Malaya, depending on the political situation in the world. He said there was no fear of Malaya not being able to sell her rubber, because natural still had many advantages over synthetic, but it must be realized that the price should be reasonable and the quality maintained to standard.

He forecast that in future there would be far less fluctuation in the price so the big concern was to maintain quality. 'If you don't you will cut your own throats', he warned.

Rubber Pirates

Pirates and rubber snatching have been in the news in Penang this week.

According to the police, pirates stopped a coastal vessel, boarded it a few miles outside territorial waters and seized 20 tons of rubber.

Capt. Ly Pasutanavin, the Thai master of the vessel, reported that his ship was intercepted in territorial waters and the pirates ordered him to sail for the open sea.

Once outside the three-mile limit, the pirates unloaded the rubber into their own boat and made off in the direction of Balawan in Sumatra, said the captain. He added that there were eight pirates, two of whom were armed.

Two days later, the Penang police seized a motor boat and two lorries in Penang suspected of carrying the 20 tons of stolen rubber. More than 150 bales were recovered.

It was also reported that as a result of a tip-off, police picked up seven men from a Penang hotel for interrogation.

Also off Penang, a tongkang carrying 155 tons of rubber to a Russian ship sank after springing a leak. As the rubber, valued at $285,000 drifted towards the waterfront, more than 100 sampans were sent out to recover it.

Most of the rubber, which was being shipped by Harper Gilfillan and Co. Ltd., was saved. The tongkang was tied alongside the Russian ship, *Debaltcevo*, bound for Odessa, when it began to sink.

Brunei Pioneer Dies

Haji Mohamed Daud, the man who first introduced rubber planting in Brunei, died this week at the reported age of 102. He went to Brunei from Malaya armed with rubber seeds shortly after pioneer planting methods had been used in Malaya. He prospered, becoming a landowner and prominent businessman.

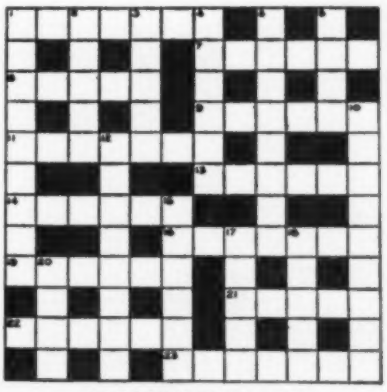
Ekco London Move

Ekco Plastics Ltd. is moving its London offices from 5 Vigo Street, W.1, to 41-47 Old Street, E.C.1. The new address will be effective from August 28.

Semtex Flooring Contract

Semtex Ltd. has supplied and laid a total of 49,770 sq. ft. of Semastic decorative tiles, and 6,354 sq. ft. of Vinylex tiles at Grosvenor House, Croydon — a recently-completed block of shops and offices.

RPW CROSSWORD



CROSSWORD No. 80

CLUES ACROSS

1.—Polyisoprene, polybutadiene, polybutene are all examples of this.
7.—An Old Testament book. Sue is back outside.
8.—The cad loses initially for the water animal.
9.—Groom.
11.—A nautical appendage.
13.—Musical instruments.
14.—Goods sent abroad are for this.
16.—Everlasting.
19.—Bring about.
21.—Concur.
22.—Step.
23.—Take back.

CLUES DOWN

1.—An olefin.
2.—Ate the centre another time.
3.—Santa is associated with nautically.
4.—Retidy the hair.
5.—Plasticizer.
6.—An electrical safety device.
10.—Able to regain approximately original shape after being deformed.
12.—Butadiene, for example. Oil fined (anagram).
15.—Tie up.
17.—Strictly correct.
18.—Neither Pa nor Ma include her.
20.—Destiny.

(Solution appears on page 305)

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Rubber Statistics

FRANCE—US—BRAZIL—CANADA—SWITZERLAND—THAILAND

FRENCH tyre production in June is estimated at 23,050 tons compared with a final figure of 21,950 tons in May. This brings total estimated production for the first half of this year to 136,705 tons against 134,165 in the first half of 1960.

Industrial rubber production in June is estimated at 20,280 tons against the revised figure for May of 19,130 tons and a final figure for April of 17,970 tons. This brings estimated production for the first six months of this year to 114,090 tons against 113,660 tons in the same period in 1960.

United States

Imports of natural rubber in April totalled 21,554 metric tons and imports of latex were 3,029 metric tons, the Department of Commerce in New York reports. Natural rubber imports in May were 27,075 metric tons and latex imports 2,796 metric tons.

The March imports figures were 24,971 and 3,856 respectively. No June figures are yet available.

Brazil

Brazil's 1960 production of natural rubber was 22,500 metric tons, according to the Comissao Executiva de Defesa da Borracha (Rubber Defence Executive Commission).

Demand is estimated at around 72,000 tons. The deficit was made up in part by recuperation of old rubber (9,700 tons), imports of natural (22,000 tons) and synthetic (16,000 tons) rubber.

Installation of new synthetic rubber plants at Rio de Janeiro, scheduled within the next two years, should balance supply and demand at about 96,000 tons in 1963/64. Beginning in 1965 a deficit of about 1,400 tons is expected which, during the following ten years, should increase to 36,800 tons unless further steps are taken, according to the Brazilian Institute of Geography and Statistics.

Canada

Consumption of all rubber in Canada in May rose for the second successive month, although decreases in each of the first three months this year made for a decline in the first five-month period.

May consumption of all rubber amounted to 9,630 long tons, compared to 8,390 a year earlier. For the first nve months the total declined to 43,262 long tons from 47,452 a year ago.

Consumption of natural rubber in May fell to 2,690 long tons from 2,872 a year earlier, while synthetic rubber rose to 5,386 long tons from 4,179 and reclaimed rubber to 1,554 long tons from 1,339. January-May consumption of natural rubber decreased to 12,539 long tons from 16,029 and reclaimed to 6,766 long tons from 7,552, while synthetic rubber increased to 23,957 long tons from 23,871.

Production of synthetic rubber in May amounted to 13,781 long tons compared with 13,495 tons in the same month last year and in the five months to 67,897 long tons compared to 66,417 the year before. Production of reclaimed rubber in May amounted to 504 long tons, unchanged from a year ago, while in the five months it totalled 2,421 long tons, against 2,652 year before.

Switzerland

Swiss rubber imports in June totalled 1,080,183 kilos against 2,534,069 kilos in May and 1,547,756 kilos in June 1960, according to figures released by the Swiss Customs Directorate. Details were as follows (in kilos):

	June 1961	June 1960
Raw rubber	640,598	660,205
Synthetic rubber ..	386,462	762,143
Reclaimed rubber ..	5,162	17,500
Scrap rubber ..	47,961	107,908

Main supplier of raw rubber in June was Malaya with 549,121 kilos. Synthetic rubber came chiefly from the USA with 263,526 kilos, while West Germany supplied all the reclaimed rubber. Of the waste rubber 12,683 kilos came from France and 35,278 kilos from West Germany.

Thailand

Thailand exported 12,759,218 kilos of rubber of all grades during May this year, according to trade estimates.

This compared with 12,178,336 kilos exported in April and 14,410,927 kilos in May 1960.

Glass-fibre roving from four Creel-Pak cartons being sprayed simultaneously in a boat-moulding operation. This method, developed by Owens-Corning in America, means that 36 balls of roving — nine to each carton — are fed into the spray; there is no need to open a fresh carton after each ball is used up

CHALLENGE TO NR

Continued from page 297

dithiocarbamates, are extensively cross-linked during ageing, and can degrade considerably *in vacuo*.

The wider use of rubber springs in various engineering applications is hindered by little-understood relaxation processes which proceed at normal temperatures. These springs and other rubber mountings settle continuously under a load or show a continuous fall in stress under a constant deformation by amounts not obviously predictable.

It has now been found that the common manifestations of relaxation are all simply interrelated. A number of different relaxation mechanisms have been identified. These are (i) a gradual approach to an equilibrium state by slow molecular rearrangement, (ii) the transformation to a crystalline state at relatively large deformations, (iii) a parallel relaxation in filled materials at small deformations, attributed to the same cause, and (iv) a chemical relaxation at long times, apparently of the same kind as that which proceeds rapidly at elevated temperatures.

Accelerated Tests Misleading

These processes are affected in different ways by differences in rubber composition and in temperature so that accelerated tests can prove completely misleading. The present recognition of the complex nature of relaxation processes at ambient temperatures now permits a more rational approach to the design of rubber components with improved performance.

One interesting and surprising feature of the chemical relaxation process has emerged. With certain common vulcanizing systems relaxation proceeds more rapidly *in vacuo* than in air. This throws doubt on the generally accepted view that oxidative deterioration of the rubber network is the primary mechanism of stress decay but is intelligible in the light of latest knowledge about vulcanizate structure and properties.

Other interesting and important developments have been made during the year such as evaluation of the use of Superior Processing rubber in SBR. This has shown SP rubber to be a useful processing aid, although the advantages gained are not so spectacular as those obtained in natural rubber.

The development of a flame resistant latex has reached an interesting stage. It has been shown that for the production of foams this latex has very useful properties (*RPW* August 12, 237) and work is still in progress on flame resistant rubbers.

Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

BONUS time has come around for the workers of IMPERIAL CHEMICAL INDUSTRIES again. This year more than 92,000 have qualified under the company's profit-sharing scheme. And what a bonus it is. A record figure of £8,550,000 — and well over three times the gross sum distributed seven years ago, the first under the scheme. The average bonus per employee for 1960 works out at £92 17s. 10d. After deduction of personal income tax the total bonus is whittled down to £6,344,000 or an average of £68 17s. 6d. In the previous year 93,229 workers shared the gross sum of £7,305,956 or an average of £78 7s. 4d. After the tax man had his share the net sum was reduced to £5,522,989 an average of £59.4s. 10d. The company disclosed that the net bonus has been paid to the trustees of the scheme who will use it to buy up on behalf of those involved £1,883,000 I.C.I. ordinary shares to be issued by the company.

Stock is now registered in the name of an employee every second year or as soon as he is entitled to 40 or more units, whichever is the earlier. This year £2,615,000 ordinary stock will be handed over to 63,000 employees, and it is expected that the certificates will be sent off on October 16. The amount of stock handed over to 22,998 workers last year was £1,247,405, of which more than half has been retained. Already the 'bonus' shares to be given away show a nice little profit and the temptation will be strong to go ahead and sell. But my advice is that every one should be held and stored away in the old oak chest.

DUNLOP have been doing well in the export field according to a recent statement made by the chairman. In the first six months of 1961 they bounced up a healthy-looking 16% to reach record heights and accounted for one-fifth of the home group's turnover. This is good news indeed ahead of the group's half-yearly statement which is due to arrive in October.

ANCHOR CHEMICAL are paying a same again dividend of 6% at the half-way stage of their trading year. Profits for the six month period totted up to £97,767 against £125,881. But the directors point out that they stressed 12 months ago that the company was in a period of abnormally high trading. In these circumstances comparison should be made with £76,914 for the first six months of 1959 which was the second most successful year in the history of the company. In the period under review sales of rubber chemicals were affected by the reduced level of trading in the UK car industry as

Continued on page 303

Share Price Movements

Par Value	Company	1961 High	Low	Aug. 5	Latest
£1	A.E. Ind. Ord.	48/6	35/6	35/9	35/9
5/-	Albright & W. Ord.	29/6	22/6	23/-	23/6
£1	„ „ „ 5% Pref.	17/3	13/-	13/-	13/-
5/-	Anchor Chemical Ord.	25/6	16/-	18/9	18/9
4/-	Airfix	54/-	34/6	51/6	54/-
4/-	„ Non Voting	52/-	33/6	49/6	50/9
5/-	Andersons Rub. Ord.	—	—	3/9	3/9
£1	Angus Geo. Ord.	83/-	58/6	64/6	65/-
5/-	Ault & Wiborg Ord.	17/-	12/9	13/9xc	15/-
£1	Avon India Rubber Ord.	46/6	30/-	37/6	37/6
£1	„ „ „ 6% Pref.	19/3	17/6	17/6	17/6
10/-	Bakelite Ord.	66/3	42/3	46/3	45/-
£1	„ 6% Pref.	19/3	16/6	17/6	17/6
£1	Baker Perkins Ord.	59/6	40/6	48/-	46/9
4/-	Bank Bdg. Rubber Ord.	3/6	1/9	2/3	2/3
4/-	Bettix	11/9	7/6	9/6	9/6
4/-	Brammer H. Ord.	17/-	14/9	15/-	14/9
10/-	Bridge, David Ord.	60/-	28/9	30/-	28/9
5/-	Bright, John Ord.	9/6	6/9	7/3	6/9
5/-	Brit. Blting & Asb. Ord.	24/-	17/6	20/9	20/6
£1	„ „ „ „ Pref.	—	—	13/3	13/3
5/-	British Electronic Indus.	15/6	9/6	9/9	10/-
2/-	B. I. Plas. 10% Pref.	9/9	4/3	9/9	9/9
£1	BICC Ord.	62/6	50/3	55/3	58/3
5/-	BTR Ind. Ord.	19/9	10/-	11/-	10/3
£1	„ „ 7½% Pref.	21/6	19/9	20/-	20/-
10/-	Castrol Ord.	52/-	37/-	38/9	40/-
£1	Courtaulds Ord.	47/6	34/6	37/-	36/-
£1	„ 5% 1st Pref.	16/-	14/-	14/-	14/-
£1	„ 6% 2nd Pref.	18/3	15/9	15/9	16/-
4/-	Cow, P. B. Ord.	10/6	7/6	9/3	9/6
£1	„ „ 5% Pref.	14/3	13/-	13/6	13/-
1/-	Dannimac Mfg. Ord.	15/3	11/3	11/6	11/6
10/-	De La Rue Ord.	70/-	51/9	52/6	55/-
£1	„ „ „ 3½% Pref.	10/6	9/6	10/6	10/6
10/-	Distillers Co. Ord.	41/3	31/-	33/3	36/3
£1	„ „ 6% Pref.	20/3	17/6	17/6	17/9
£100	„ 5% Conv. Loan	£96	£90	£91½	£91½
£100	„ 5½% Unsec. Loan	£86½	£75	£76½	£75½
10/-	Dunlop Rubber Ord.	29/-	21/6	24/6	25/3
£1	„ „ 5½% Pref.	16/-	13/9	14/-	14/6
£100	„ 3½% 1st Debs.	£69	£67	£68	£68
£100	„ 4½% 2nd Debs.	£79	£76	£78	£76
£1	Eng. Elect. Ord.	40/6	30/6	30/9	31/3
4/-	Ebonite Cont. Ord.	8/6	6/-	6/6	6/9
£1	English China Clays Ord.	117/6	80/-	89/3	91/-
£1	Goodyear Tyre 4% Pref.	11/6	9/9	10/-	10/-
5/-	Greeff Chem. Ord.	37/6	22/9	28/-	25/-
10/-	Greeff Chem. 5½% Pref.	8/3	7/-	7/-	7/3
4/-	Greengate & Irwell Ord.	6/9	4/9	5/-	4/9

Par Value	Company	1961 High	Low	Aug. 5	Latest
5/-	Hackbridge Hldg.	6/9	4/9	5/3	5/-
£1	Harrisons & Crosfield Dd.	57/6	47/6	49/-	49/6
1/-	Hunt & Moscrop Ord.	2/3	1/3	1/9	1/9
£1	Imp. Chem. Ord.	81/6	63/-	68/3	70/-
£1	„ „ 5% Pref.	16/3	13/6	14/3	14/3
£100	„ 4½% Unsec. Loan	£83	£76½	£78	£78
£100	„ 5½% Conv. Loan	£93	£86	£86	£86
1/-	Kleemann (O. & M.) Ord.	21/3	8/3	19/-	19/-
£1	„ 6½% Pref.	22/3	16/3	22/3	16/9
5/-	Laporte Ind. Ord.	30/9	23/3	23/3	24/9
£1	„ „ 7½% Pref.	23/-	20/-	21/3	20/-
£1	Leyland & Birm. Rubber Ord.	59/3	46/3	50/-	51/3
£1	„ „ „ 6% Pref.	18/9	15/-	16/3	16/3
2/-	London Rubber	15/6	9/6	13/3	13/6
£1	„ 6% Red. Cum. Pref.	20/-	16/9	17/6	17/6
£1	McKechnie Bros. Ord.	43/-	27/-	40/-	41/3
£1	„ „ 'A' Ord.	45/-	35/-	38/9	38/9
£1	„ „ 6% Cum. Pref.	18/-	16/-	16/6	16/6
5/-	Monsanto Chem. Ord.	27/6	20/6	20/6	21/3
£1	„ „ 3½% Pref.	12/6	11/3	11/3	11/3
£100	„ „ 6% Debs.	£98	£89	£89½	£89
5/-	Miles (H.G.) Hldgs. Ord.	7/9	7/-	7/6	7/6
2/-	Movitex	—	—	5/3	5/3
£1	North British Rubber	21/3	12/-	12/-	13/-
5/-	Northwestern Rubber	13/-	9/-	12/-	12/-
5/-	Plastic Enginrs. Ord.	40/-	28/6	30/9	30/-
10/-	Projectile & Eng. Ord.	50/6	22/6	31/9	34/-
5/-	Redfern Holdings Ord.	3/9	2/9	3/-	3/-
2/-	RFD Ltd. Ord.	6/3	3/6	4/9	4/9
£1	„ „ 5½% Pref.	15/-	11/3	12/6	11/3
2/-	Rubber Imp. Ord.	6/3	3/3	3/9	4/3
2/-	„ „ 'A' Ord.	5/-	2/6	3/3	3/3
£1	„ „ 5% 1st Pref.	13/3	11/3	12/3	12/3
5/-	Rubber Reg. Ord.	18/3	14/6	15/-	14/6
4/-	Shaw Francis Ord.	24/6	14/-	13/-	14/-
£1	Shell Ord. (Reg.)	140/-	108/-	122/6	122/6
2/-	Silentbloc Ord.	10/6	8/3	9/3	9/-
5/-	Storey Bros.	46/-	34/-	34/-	34/-
2/-	Sussex Rubber Ord.	2/7½	1/9	1/9	1/9
5/-	Sutcliffe Speak Ord.	18/6	12/6	13/-	12/6
£1	Tootals	35/6	28/-	29/-	28/6
£1	Turner & Newall Ord.	78/-	55/-	63/6	65/6
£1	„ „ „ 7% Pref.	21/6	19/-	19/3	19/6
5/-	Universal Asbestos Ord.	27/-	20/-	21/3	20/3
£1	Venesta Ord.	76/-	61/-	63/-	63/-
5/-	Viscose Dev. Ord.	16/3	13/3	13/9	13/9
5/-	Warne W. (Holdgs.) Ord.	21/6	14/9	19/-	18/9

Rubber Markets

LONDON

Switching of Terminal positions relieved general dullness and values were maintained by reserved attitude of sellers, strengthened by the Berlin situation. Following slightly higher Singapore levels prices hardened. A small advance was supported by increased interest in September shipments to the Continent accompanied by short covering by dealers.

Latest prices are as follows:

No. 1 RSS Spot: 24¾d.-25d.

Settlement House:

September 24⅞d.-25⅛d.

October 25d.-25¼d.

November 25¼d.-25½d.

January/March 25⅜d.-25⅝d.

April/June 25½d.-25¾d.

July/September 25¾d.-25¾d.

No. 1 RSS cif basis ports:

August 24⅞d.-25⅛d.

September 24⅞d.-25¼d.

October 25d.-25¼d.

Godown:

September 84¼ Straits cents nominal.

LATEX

Centrifuged 60% latex per gallon in drums, seller, September, October, 14s. 6d., cif European ports. Spot, seller, 14s. 10d. Bulk, seller, d.w. 14s. 4d. Normal, seller, September, October, 11s. 4d.

NEW YORK

The New York rubber market ruled as under on August 14:

DEALERS' PRICES

	US cents per lb., ex-dock	
	August 14	Previous
No. 1 RSS, Aug.	29⅛b–30a	29⅜a
Sept.	29⅛b–30a	29⅜a
No. 2 RSS, Aug.	29⅛b–29⅞a	29⅜a
Sept.	29⅛b–29⅞a	29⅜a
No. 3 RSS, Aug.	29⅛b–29⅜a	29⅛a
Sept.	29⅛b–29⅜a	29⅜a
No. 1 RSS, Spot	30⅛n	29⅞n
No. 3 amber blanket crepe, August	26n	25⅞n

FUTURES—REX CONTRACT

	August 14	Prev. Close
September	30.05b–30.30a	29.75b–30.00a
November	29.70b–30.00a	29.40b–29.60a
January	29.50b–29.75a	29.15b–29.30a

Sales: 5. Tendency: Firm.

Rubber futures were firmer on August 14 on light covering in a very thin market. Traders said the Berlin crisis may have induced some covering abroad which firmed prices at foreign centres and aided the market here. Physical rubber was quiet. In the closing stage, futures continued firm.

SINGAPORE

Prices advanced at the opening on August 14 on short covering induced by the Berlin situation but conditions were very quiet. Changes were negligible in later trading. The majority of dealers were inclined to await further political developments and remained reluctant to trade. Extremely quiet conditions prevailed in the afternoon but the undertone was steady. Lower sheets were in some demand. Sellers were reserved.

	Malayan cents per lb., fob Malayan ports to open ports	
	Aug. 14	Prev. Close.
No. 1 RSS, Sept. ..	85⅛–85¼	84⅛–84⅜
October	85½–85⅞	—
No. 2 RSS, Sept. ..	84¼–85	—
No. 3 RSS, Sept. ..	83¾–84⅛	—
No. 4 RSS, Sept. ..	82½–83	—
No. 5 RSS, Sept. ..	74 –75	—
No. 1 RSS, Spot ..	84½–84¾	83 –83½
No. 3 blanket thick re-milled crepe, Sept.	73¾–74¾	—
No. 1 fine pale crepe Sept.	93¼–94¼	—
2X thin brown crepe, Sept.	71¾–72¼	—

Tendency: Quiet but steady.

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob at 166.60d. per gallon.

AMSTERDAM

The Amsterdam rubber market ruled as under on August 14:

	Guilders per kilo	
No. 1 RMA	Aug. 14	Previous
August	2.33	2.31
September	2.33	2.31
July/September ..	Expired	2.31
October	2.33	2.31
November	2.33	2.31
December	2.33	2.31

Sales: Nil. Tendency: V'Steady.

DJAKARTA

	Rupiahs per kilo	
	Aug 14	Previous
Spot No. 1 Priok ..	34.00b	33.75b
Spot No. 2 Priok ..	33.00b	32.75b
Spot No. 3 Priok ..	32.00b	31.75b
No. 1 fine pale crepe, spot..	31.50b	31.50b

Tendency: Steady.

CEYLON

The price of No. 1 RSS at Colombo on August 14 was 103 Ceylon cents per lb.

BANGKOK

The price of No. 1 RSS at Bangkok on August 14 was 27.37½ (27.12½) US cents per lb.

Soviet Plastics

The second issue of *Soviet Plastics* (designated 8) — a cover-to-cover translation of the monthly Russian journal *Plasticheskie Massy* — has now been published.

Articles include one on the synthesis of acenaphthylene, on its polymers, and some copolymers with other monomers, and one on the effect of monomer content on the properties of unsaturated polyester resins and on glass reinforced plastics.

Soviet Plastics is produced, with the support of DSIR, by the Rubber and Plastics Research Association, in connexion with Rubber and Technical Press Ltd., Gaywood House, Great Peter Street, London S.W.1.

The next issue will contain a special section on the use of polymeric material in the Soviet building industry.

STOCK MARKET

Continued from page 302

compared with last year's boom conditions. A further factor affecting profitability was the high promotional expense in developing sales of Cycolac, the high impact plastic for which a very important future is forecast. Sales of this product, the chairman, Mr F. Savage, reports, are progressing 'most satisfactorily' both at home and abroad.

No Sale

There were no sales from the UK Board of Trade's stock of natural rubber during July.

The amount of rubber remaining available for sale is 26,590 tons.

A new double-walled polythene bag has been introduced by E. S. and A. Robinson Ltd., and its first commercial use is for packing bulb fibre. The two walls are joined at the seam of the bag, and can be tack-sealed together at the top to prevent loose or powdered materials from getting between the walls during filling. The open end of the bag is heat-sealed after filling, in the normal way

Industry INTELLIGENCE

Technical Data

Santocure MoR 90

Santocure MoR 90 is an accelerator containing 90% 2-(4-morpholinylmercapto) benzthiazole and 10% 2-benzthiazyl disulphide. It has been developed to meet the needs of compounders who are seeking somewhat safer processing characteristics than are imparted by Santocure. The use of Santocure MoR 90 is claimed largely to eliminate the need for retarders, and could lead to economies in compounding.

Technical Service Bulletin No. 18A/1 issued by Monsanto Chemicals Ltd., 10-18 Victoria Street, London, S.W.1, describes the general properties and processing and vulcanizing characteristics of Santocure MoR 90 and gives the physical properties of natural and SB rubber HAF tread stocks, containing Santocure, Santocure MoR and MoR 90.

Peptizer 640

Laboratory Report No. LA7/1, published recently by Monsanto Chemicals Ltd., 10-18 Victoria Street, London, S.W.1, describes the chemical characteristics and use of Peptizer 640.

This peptizer is claimed to possess high activity in both natural and SB rubbers, accelerating mastication and increasing the output of compounding equipment while reducing power consumption. It is economical and effective in use and has no effect on staining or ageing of vulcanized stocks. When used at normally recommended levels it has no effect on scorch or cure rate, but at higher levels it causes mild activation of cure. Concentrations of from 0.1-0.4phr. in natural rubber, 0.5-1.5phr in SBR 1500 types and 0.3-1.2phr in SBR 1700 types are recommended.

Another application of Peptizer 640 is in slightly scorched compounds where incorporation of 1-3phr effectively restores the processibility by lowering the stock plasticity.

Celluflock

Celluflock is a carbohydrate produced by an alkaline treatment of bleached wood pulp to separate the insoluble alpha cellulose fibres from the soluble fractions. The fibres obtained are further refined to products of specified fibre length and specified colour.

The material is white in colour and low in density. It is not a reinforcing pigment, but is recommended as a processing aid for rubber compounds. Because of its long fibre length, five to ten phr have very pronounced effects on the stiffness of uncured stocks which decrease mill shrinkage, improve the smoothness and reduce cold flow. In addition, it reduces mould shrinkage during vulcanization and helps to overcome spreading tendencies of rubber heels and top lifts during service.

Celluflock is offered in two grades, each having the same general characteristics. Celluflock 1374 has a longer fibre length, imparting superior processing characteristics. Celluflock 1372 is recommended where average properties are satisfactory.

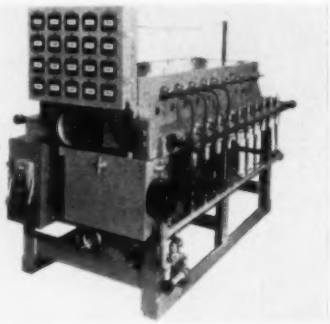
Stocks are not yet available in the UK, but samples or trial quantities and copies of News Bulletin No. 81 giving details of the material can be obtained from Columbian International (Great Britain) Ltd., 116 Cannon Street, London, E.C.4.

Machines, Materials and Equipment

Tube Fatigue Tester

Complete testing apparatus for evaluating extension and compression fatigue of tyre cord in accordance with the Goodyear Tube Fatigue Method is now being produced by Scott Testers Inc., 124 Blackstone Street, Providence, RI.

The GTF Tester incorporates

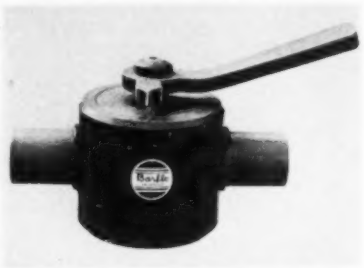


recent design improvements developed by the Comptoir des Textiles Artificiels, and is based on an original design by the Goodyear Tire and Rubber Co. to conform with ASTM Method of Test D885-59T. Unlike the original design wherein failure of a single tube specimen completed the test run, the improved design now permits the tester to continue to operate despite blowouts of one or more of the 20 specimens under test.

Sample preparation equipment is also produced for use with the fatigue tester. The preparation table has winding drum for proper application of test cords between rubber sheet material. A rubber applier, spiral wrap mechanism, and curing moulds are also included for building sample fatigue tubes. Preflexing apparatus is provided to preflex each sample prior to test, in accordance with ASTM specification.

All-Plastic Valve

Considerable demand for all-plastic valves from the chemical, engineering and food industries has resulted in



Barflo Ltd., 56 Cavendish Place, Eastbourne, increasing their standard range.

An on/off plug valve, illustrated here, is now available in sizes from ¾in. nominal bore, manufactured in pvc, high impact pvc and other rigid plastics.

Publications

Polysar Krynac

Two recently issued technical reports on applications of Polymer Corporation products are Nos. 61:5B and 61:5C. These are available in this country from Polymer (UK) Ltd., Walbrook House, Walbrook, London, E.C.4.

Report No. 61:5B describes the production of a Polysar Krynac 803/pvc sponge for thermal insulation. The compound described extrudes rapidly and smoothly at a temperature low enough to prevent premature release of the blowing agent, and the cured sponge has low density, uniform structure and a good surface skin. The blend of Krynac 803 with pvc was selected because of good ozone, weather and oil resistance and is recommended for use in the vicinity of equipment where oil leakage and corona discharge may be encountered.

Report No. 61:5C describes a compound based on Polysar Krynacs 801 and 803 which has the properties required of a printing plate gum. This compound calenders well, producing smooth blister-free sheets. Advantages claimed for the use of printing plates of this type include light weight, easy production, wear resistance and flexibility. They can be attached to printing cylinders of any diameter, are resistant to oil-based inks and cleaning fluids, yet have good ink pick-up and print uniformly and accurately on a wide variety or materials.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

RADYNE

(813,272). Machines for welding, bonding, brazing, soldering and glueing; bottling machines and packaging machines; parts and fittings included in Class 7 of all the aforesaid goods; and work tables and work-feeding apparatus and appliances, all being parts of machines and included in Class 7. Radio Heaters Ltd., 42 Bedford Avenue, London, W.C.1. (Class 7; July 5 1961.)

Propathene

(812,394). All goods included in Class 11 made of polypropylene. Imperial Chemical Industries Ltd., Imperial Chemical House, Millbank, London, S.W.1. (Class 11; July 5 1961.)

Lapis (817,154). Gutta-percha, india rubber, balata, imitation gutta-percha, imitation india rubber, imitation balata, and articles included in Class 17 made from these substances; materials for packing (jointing), stopping and insulating; asbestos; mica, and products thereof included in Class 17; non-metallic hose pipes; plastics included in Class 17 in the form of sheets, blocks, rods and tubes, being for use in manufactures. Lapis Engineering Co. Ltd., 55 Pollards Hill North, London, S.W.16. (Class 17; July 5 1961.)

Shojilon (817,689). Sheets of transparent and translucent plastics included in Class 17. Kelscreen Co. Ltd., Midland Bank Chambers, 43 Market Place, Kingston-on-Thames, Surrey. (Class 17; July 5 1961.)

Duraflor (817,823). Floor coverings. S. and J. Walsh (Plastics) Ltd., St. Lawrence Mill, Great Harwood, Blackburn, Lancashire. (Class 27; July 5 1961.)

Durafoam (817,824). All goods included in Class 27 containing foamed materials. S. and J. Walsh (Plastics) Ltd., St. Lawrence Mill, Great Harwood, Blackburn, Lancashire. (Class 27; July 5 1961.)

Starsol (B808,871). Articles included in Class 17 made of rubber or of synthetic rubber. Salpa Francaise, 116 Champs-Elysées, Paris, France. Address for service is c/o Boult, Wade and Tennant, 112 Hatton Garden, London, E.C.1. (Class 17; July 19 1961.)

Tecahose (812,875). Flexible pipes and tubes all made from extruded plastics; flexible pipes and tubes all made from extruded plastics and braided or reinforced with metal wire or with textile filaments; flexible pipes and tubes all made from extruded plastics and braided or reinforced with metal wire or with textile filaments and formed as multiple assemblies; parts of all the aforementioned goods; all included in Class 17. Tecalemit Ltd., Plymouth, Devon. (Class 17; July 19 1961.)

Teca (812,876). Flexible pipes and tubes all made from extruded plastics; flexible pipes and tubes all made from extruded plastics and braided or reinforced with metal wire or with textile filaments; flexible pipes and tubes all made from extruded plastics and braided or reinforced with metal wire or with textile filaments and formed as multiple assemblies; parts of all the aforementioned goods; all included in Class 17. Tecalemit Ltd., Plymouth, Devon. (Class 17; July 19 1961.)

'Ferraprint' (814,188). Textured and non-textured flexible sheet material included in Class 17 consisting of laminations of plastics; all being printed. W. W. Chamberlain and Sons Ltd., 6 Wood Street, Higham Ferrers, Wellingborough, Northamptonshire. (Class 17; July 19 1961.)

Solution to RPW Crossword

(See page 299 this issue)

ACROSS.—1, Polymer. 7, Exodus. 8, Otter. 9, Ostler. 11, Yardarm. 13, Banjos. 14, Export. 16, Eternal. 19, Effect. 21, Agree. 22, Stride. 23, Retract.

DOWN.—1, Propylene. 2, Later. 3, Maria. 4, Recomb. 5, Softener. 6, Fuse. 10, Resilient. 12, Diolefin. 15, Tether. 17, Exact. 18, Norma. 20, Fate.

Increases of Capital

Fit Ltd. (208,704), manufacturers of, and dealers in, materials for mending motor tyres, etc., 103/107 Queen Street, Sheffield. Increased on December 21 1960, by £23,000 in £1 ordinary shares, beyond the registered capital of £2,000.

Movitex Ltd. (389,713), formerly Plastic Fasteners Ltd., 56 Moorgate, E.C.2. Increased on January 19 1961, by £90,000 in 2s. ordinary shares, beyond the registered capital of £10,000.

Seidners Ltd. (473,004), manufacturers of, and dealers in, goods made wholly or partially of leather, plastics, etc., 101 Hatton Garden, E.C.1. Increased on December 22 1960, by £17,500 in £1 ordinary shares, beyond the registered capital of £2,500.

Aquaplast Ltd. (404,047), manufacturers of, and dealers in, plastics, etc., 6 Hannington Street, Newcastle upon Tyne, 6. Increased on November 28 1960, by £4,400 in £1 ordinary shares, beyond the registered capital of £600.

Changes of Name

Hygienic Plastic Wrappings Ltd. (649,416), manufacturers of, and dealers in, slimming garments, etc., Britannia Works, Thurmaston, Leicester. Name changed to Slimwear Ltd. on January 19 1961.

Parkhill Plastics Ltd. (404,727), 8 Cressy Road, N.W.3. Name changed to Mansell Hunt Catty and Co. (Export) Ltd. on January 23 1961.

Channel Plastics (Euston) Ltd. (614,539), 667/677 Eastern Avenue, Ilford. Name changed to George E. Gray (Distributors) Ltd. on December 1 1960.

Plastic Fasteners Ltd. (389,713), 2/3 Empire Way, Wembley, Middlesex. Name changed to Movitex Ltd. on January 19 1961.

NEW COMPANIES

Rabsplast Ltd. (697,832). July 10. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, plastics materials, etc. The first directors are to be appointed by the subscribers.

Freightmaster Tyre Co. Ltd. (697,867). July 10. Capital: £100 in £1 shares. The first directors are to be appointed by the subscribers. Regd. office: 26/28 Hallam Street, W.1.

Basildon Plastics Ltd. (698,169). July 13. Capital: £100 in £1 shares. The directors are: James H. W. Baker, 338 Clayhill Road, Basildon, Essex; Leslie G. Smith, 62 Methersgate, Basildon, Essex. Regd. office: 21 Bowlers Croft, Basildon, Essex.

Plastic Moulding (Cradley) Ltd. (698,091). July 12. Capital: £3,000 in £1 shares. The directors are: Frederick G. Shaw, 58 Park Lane, Cradley, Staffs.; Percy J. Rose, 31 Drews Holloway South, Cradley, Staffs.

Roy Swinbourne Tyres Ltd. (698,101). July 12. Capital: £1,000 in £1 shares. The directors are: Royston H. Swinbourne, 1 The Parklands, Pedmore, Stourbridge, Worcs.; Peter H. E. Tanser, Bocquaire, Somerleyton Avenue, Kidderminster, Worcs. Regd. office: 1 The Parklands, Pedmore, Stourbridge, Worcs.

Plaslast Ltd. (698,137). July 12. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, plastics materials, etc. The directors are to be appointed by the subscribers.

S. Kaye (Southampton) Ltd. (699,309). July 25. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, artificial teeth, etc. The directors are: Albert E. Campbell, Eastways, Pound Lane, Ampfield, Hants; Herbert E. B. Hooper, Glendale, Poles Lane, Otterbourne, Hants; Stefan Kaye, 15 Minstead Avenue, Harefield, Southampton. Regd. office: 2 Portland Street, Southampton.

Rosemar Plastics Ltd. (698,724). July 19. Capital: £100 in £1 shares. The directors are to be appointed by the subscribers. Regd. office: 126 Wigmore Street, W.1.

D. G. Todd and Co. (Packaging) Ltd. (699,278). July 25. Capital: £2,000 in £1 shares. To carry on the business of fabricators, manufacturers of, and dealers in, plastics materials, etc. The directors are: Daniel G. Todd, 68 Westbourne Road, Birkdale; Jack Robinson, 67 Trafalgar Road, Birkdale. Regd. office: Grosvenor Works, Tulketh Street, Southport.

Bucks Tyre Co. Ltd. (699,470). July 27. Capital: £2,500 in £1 shares. The directors are: Leslie E. Congger, 34/6 Walton Street, Aylesbury; William J. Hawkins, 20 Northumberland Avenue, Aylesbury; David E. Goodman, 113 Whaddon Chase,

This Terylene reinforced conveyor belting, made by the Leyland and Birmingham Rubber Co. Ltd., has been running in a Lancashire colliery for over 12 months. Despite adverse conditions, substantially the same belt has been in use the whole time

Aylesbury. Regd. office: The Tyre Centre, Buckingham Road, Aylesbury, Bucks.

M.J. Ivory-Plastics Ltd. (699,459). July 27. Capital: £1,000 in £1 shares. The directors are: Michael J. Ivory and Pamela J. Ivory, both of 34 Fairford Avenue, Luton, Beds. Regd. office: Old Dye Works, Charles Street, Luton, Beds.

Swinton Plastics Ltd. (698,415). July 14. Capital: £2,000 in £1 shares. To carry on the business of manufacturers of, and dealers in, plastics, etc. The directors are: Geoffrey F. F. Boult, Kingswood House, Dalehouse Lane, Kenilworth; Peter C. Clough, 67 Jervis Crescent, Streetly; Kenelm H. F. Rose.

Plasticmass Ltd. (698,488). July 17. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, plastics, etc. The first directors are to be appointed by the subscribers.

Tyneside Processing Ltd. (698,542). July 17. Capital: £1,000 in £1 shares. To carry on the business of tumbling, dipping, finishing and assembling components, processing, rubberizing, insulating and vulcanizing all types of raw materials and manufactured articles, finishing and assembling of wood, metal and plastics, and other materials, etc. The directors are: Viktor F. Meyer and Stephanie Meyer, both of 'Oversdale', Lindisfarne Road, Newcastle upon Tyne, 2.

Edwards (Dental Laboratories) Ltd. (698,587). July 18. Capital: £1,000 in £1 shares. The directors are: Edward A. Edwards and Mrs. Alice R. Edwards, both of 46 Hadley Way, N.21. Regd. office: 112 Harley Street, W.1.

Robert Whitecross and Partners Ltd. (698,720). July 19. Capital: £100 in £1 shares. To undertake research and development into the application of high polymers and plastics and synthetic materials of all kinds, etc. The directors are: Mrs. Wendy Sheldon, 6 Sellwood Road, Northcourt, Abingdon; Rodney G. Bell, 1/5 Broad Street, Oxford.

Tyre Services (Edinburgh) Ltd. (698,857). July 19. Capital: £100 in £1 shares. The directors are: John Blacklock and Mrs. Winifred Blacklock, both of 58 Scotby Road, Scotby, Carlisle. Regd. office: Durranhill Industrial Estate, Carlisle.

Tyre Services (Newhouse) Ltd. (698,858). July 19. Capital: £100 in £1 shares. The directors are: John Blacklock and Mrs. Winifred Blacklock, both of 58 Scotby Road, Scotby, Carlisle. Regd. office: Durranhill Industrial Estate, Carlisle.

M.G.S. (Plastics) Ltd. (698,776). July 19. Capital: £1,000 in £1 shares. To manufacture, buy, sell, treat, process and prepare all kinds of plastics materials, etc. The first directors are to be appointed by the subscribers. Regd. office: 5a Canal Estate, Langley.

Latest Wills

Harry Johnston, of Harwinden, Lochgreen Road, Falkirk, formerly manager of a rubber plantation in Malaya, who died on February 19 1961, left personal estate in England and Scotland valued at £38,553.

Arthur Conrad Coombs, of 2b Calonne Road, Wimbledon, S.W., formerly a director of H. A. Coombs Ltd., Farringdon Avenue, E.C.4, now at Surbiton, who died on May 21 1960, intestate, left £3,499 net value.

CLASSIFIED ADVERTISEMENTS

RUBBER AND PLASTICS WEEKLY

APPOINTMENTS VACANT

6d. a word, Minimum 12/6 Box 2/-

APPLICATIONS are invited for the position foreman extrusion department of a rubber company in Surrey. Pension and bonus schemes in operation.—Write in confidence, giving full details of age, experience and present salary to Box 445. (445)

DESIGNER required for rubber and plastic connector field, capable of following job from customer's enquiry to production.—Full details to Reliance Cords and Cables Ltd., Staffa Road, Leyton, E.10. (450)

EXPANDING North-East Lancashire plastics company requires a development engineer with experience of hand lay-up and match metal moulding in both epoxy and polyester resins. This is a senior appointment and only first-rate engineers need apply.—Box 418. (418)

EXPERIMENTAL officer or assistant experimental officer required by Fighting Vehicles Research and Development Establishment (War Department), Chertsey, Surrey, for initiating and supervising of development work on pneumatic and solid tyre and wheel equipment for fighting vehicles. Duties include advising on application of equipment to specific vehicles, keeping abreast of developments by tyre companies, compilation of information on use and maintenance of tyre equipment; to advise generally on application of rubber components in running gear of fighting vehicles. Qualifications and experience: HNC or equivalent in mechanical engineering. Experience an advantage. Knowledge of rubber as an engineering material rather than experience in processing and chemical formulation of rubber mixes. Age 18-28 for Assistant Experimental Officer, salary £450—£983. Experimental Officer, minimum age 26, salary £1,057—£1,336.—Forms from Ministry of Labour, Technical and Scientific Register (K), 28 King Street, London, S.W.1, quoting C536/1A. (444)

FOREIGN tyre company, all technical and senior staff English speaking, require a qualified chemist and an engineer both with tyre experience to build up research team. Attractive conditions for period of contract. Interviews in London.—Further particulars will be sent to suitable applicants to Box 449. (449)

LABORATORY assistant (male) wanted by rubber manufacturers in Bermondsey. Age approximately 16/18 with 'A' or 'O' level G.C.E. subjects. Previous laboratory experience desirable but not essential. Holiday arrangements honoured. Salary £300/£400 p.a.—Please apply to C. E. Heinke and Co. Ltd., 87 Grange Road, London, S.E.1. BERmondsey 4461. (435)

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We are certain an experienced man exists in the U.K. who would relish the challenge of this appointment. We are equally certain that the high standards of machine made, hand built, braided, heavy and general hose, for which we are renowned will not deter a first class Manager who having successfully accomplished his present assignment is seeking fresh fields to conquer.

Challengers are assured their confidence will be respected when giving a full summary of their careers to Box No. 749 Keith & Co., 137 Princes Street, Edinburgh. (443)

SALES/TECHNICAL manager required for Midland company manufacturing plastic machinery. The candidate to be capable of administering sales office routine and have a general knowledge of the plastic industry, particularly in the field of extrusion equipment.—Box 446. (446)

YOUNG chemist/technologist with experience in PVC compounding required for evaluation and technical service work on additives for PVC.—Applications in strict confidence to: Head of Research and Development, Victor Wolf Limited, Croft Street, Clayton, Manchester, 11. (442)

APPOINTMENTS VACANT

Large Rubber Company in the Manchester area have vacancies for

TECHNOLOGISTS

(1) For moulding and general mechanical goods development in rubber and plastics.

(2) For responsible position in preparing factory making and control specifications for rubber and plastic proofed goods.

Salary will vary according to age, experience and qualifications.—Write to Box 429. (429)

APPOINTMENTS WANTED

6d. a word, Minimum 10/- Box 2/-

GRADUATE organic chemist, 32, Canadian, residing United States, fully experienced all mechanical goods and tyres, seeks responsible, challenging position anywhere in world.—Box 423. (423)

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ILFORD, Essex. (452)

MANUFACTURERS of roughing machines for rubber sheeting, sponge rubber, splitting machines, leather cloth plant, embossing plates and rollers, spreading machines and presses.—G. L. Murphy Ltd., Imperial Works, Menston, Nr. Leeds. (238R)

RECONDITIONED second-hand jacketed vulcanising pan, 5ft. dia. x 10ft. long, boltless type door, 80 p.s.i. W.P., condition as new.—Box 432. (432)

SHAW 60in. x 22in. mill with 100 h.p. drive. 30in. x 24in. and 21in. single geared cracker with 200 h.p. drive. Pair of 50in. x 18in. single geared mills with 140 h.p. drive. Several smaller mills.—Reed Brothers (Engineering) Ltd. (Mr. C. E. M. Hardie—Receiver and Manager), Replant Works, Woolwich Industrial Estate, London, S.E.18. Tel.: Woolwich 7611. (433)

UNUSED 60in. x 22in. single geared mixing mill, friction ratio 1.15 to 1, Vibro mounted, Lunn safety equipment, driven by 125 h.p. slip ring motor.—Box 434. (434)

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6d. a word, Minimum 12/6 Box 2/-

USE chlorinated paraffin K71 for economical self-extinguishing of Polyester/glass laminates. Regular supplies available from Chemicals Trading Company Ltd., Cree House, 18-20 Creechurch Lane, London, E.C.3. Tel. AVEnue 5488. (486)

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(447)

ADVERTISER wishes to contact direct importers of Nigerian rubber. Buyers of substantial tonnages regularly both spot and shipment.—Reply to Box 448. (448)

NEW company wants prompt quotations for specialist mouldings. Full technical data available on compounds to be used. Must be prepared to give good service. Write now for details.—Box 440. (440)

WHITE manufacturer's sole crepe cuttings required. 5 tons monthly.—Offers to Box 451. (451)

Specialists in

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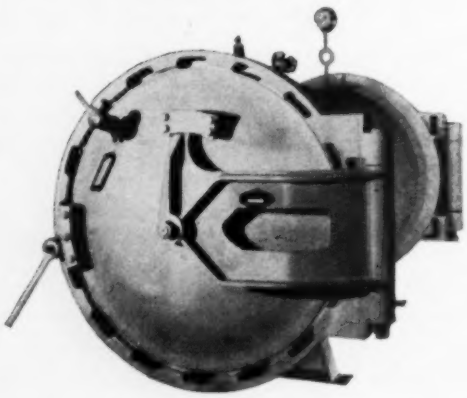

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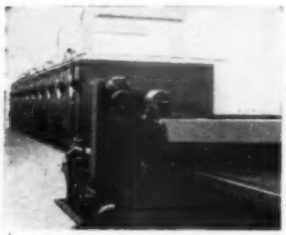

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	Page
Abrasive Developments Ltd.	—
A.E.W. Ltd.	—
Allcock, J., & Sons Ltd.	—
Amalgamated Oxides (1939) Ltd.	—
Anchor Chemical Co. Ltd.	275
Anderson, Joseph, & Sons Ltd.	—
Armour Hess Chemicals Ltd.	—
Associated-Rediffusion Ltd.	—
Astor Boisselier & Lawrence Ltd.	—
Baker Perkins Ltd.	vii
Barwell Engineering Ltd.	—
Belgrave Industries (Exports) Ltd.	—
Berk, F. W., & Co. Ltd.	—
Berstorff, Hermann	—
B.I.P. Chemicals Ltd.	—
Birch, Singleton, W., & Sons Ltd.	309
Bone Bros.	—
Boston Marine & General Eng. Co. Ltd.	—
Bridge, David, & Co. Ltd.	272
Bright, John, & Bros. Ltd.	Cover ii
British Electrical Development Association	—
British Geon Ltd.	viii, ix
British Nylon Spinners Ltd.	—
British Recovered Rubber Co. Ltd.	i
British Resin Products Ltd.	—
British Titan Products Co. Ltd.	—
British Transport Commission	—
Bush Beach & Segner Bayley Ltd.	—
Cabot Carbon Ltd.	285
Carter Bros. (Rochdale) Ltd.	—
Carlton Press Knives Ltd.	—
Chance & Hunt	xi
C.I.C. Engineering Ltd.	—
Cleggswood Oil Distillery Ltd.	—
Cohen, George, Sons & Co. Ltd.	—
Columbian International (Gt. Britain) Ltd.	—
Consolidated Zinc Corporation (Sales) Ltd.	—
Crosfield, Joseph, & Sons Ltd.	—
Croxton & Garry Ltd.	310
Derrick Davis Plastics Ltd.	—
Dietzel, Hugo	—
Distillers Co. Ltd., The	—
Dixon, T. H., & Co. Ltd.	—
Docker, John, & Co. (Engs.) Ltd.	271
Dunlop Rubber Co. Ltd.	—
Du Pont Co. (United Kingdom) Ltd.	—
Durham Raw Materials Ltd.	300
Economist Intelligence Unit Ltd., The	—
Ellison, George, Ltd.	—
English Clays Lovering Pochin & Co. Ltd.	vi
English Electric Co. Ltd., The	ii
Esso	—
eur-O-matic	309
Fawcett Preston & Co. Ltd.	—
Ferguson, A. O., & Co. Ltd.	—
Ferguson, James, & Sons Ltd.	—
Ferguson Shiers Ltd.	—
Firestone Tyre & Rubber Co. Ltd.	—
Foamair Ltd.	—
Geigy Co. Ltd., The	—
Goodyear Tyre & Rubber Co. Ltd.	—
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Hankin, Geo., & Co. Ltd.	—
Hardman & Holden Ltd.	—
Hatcham Rubber Co. Ltd.	309
Hay & Robertson Ltd.	—
Hilton, Wallace, & Co. Ltd.	309
Hubron Rubber Chemicals Ltd.	Cover iii
Hughes & Hughes Ltd.	—
Hunt Heat Exchangers Ltd.	—
Iddon Bros. Ltd.	—
Iliffe Industrial Publications Ltd.	—
Imperial Chemical Industries Ltd. (Billingham)	iii
Imperial Chemical Industries Ltd. (Dyestuffs)	282, 283
Imperial Chemical Industries Ltd. (Plastics—Melinex)	—
Imperial Chemical Industries Ltd. (Terylene)	—
Institution of the Rubber Industry	—
International Corporation Ltd.	—
International Synthetic Rubber Co. Ltd.	Cover i, 277
Ioco Ltd.	—
K.W. Chemicals	—
Kautschuk und Gummi	—
Kendell, T., & Sons Ltd.	—
Ketjen Carbon	—
Kuala Lumpur-Kepong Amalgamated Ltd.	—
Lankro Chemicals Ltd.	—
Laporte Titanium Ltd.	—
Latex Engineering Co.	296
Lavino (London) Ltd.	—
Leaver, Donald, Ltd.	—
Leeds & Bradford Boiler Co. Ltd., The	—
Lindsay & Williams Ltd.	—
Lonabarc Ltd.	—
Londex Ltd.	x
London & Scandinavian	—
Lord, R., & Sons Ltd.	308
McKechnie Bros. Ltd.	—
Maclaine, Watson & Co. Ltd.	—
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Metal Box Co.	—
Micafine Ltd.	—
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Preston Tyre Fabric Manufacturing Co. Ltd.	—
Price's (Bromborough) Ltd.	—
Pullen, James H., (1942) Ltd.	x
Quick-Wrap Tubing Co. Ltd.	—
Rubber Estate Agency Ltd.	—
Reed Bros. (Eng.) Ltd.	—
Revue Generale du Caoutchouc	308
Rhein-Chemie GmbH.	—
Robinson Bros. Ltd.	xii
Ro-Search Inc.	287, 288, 289
Robinson, Joseph, & Co. Ltd.	—
Rotunda Ltd.	—
Rubber Age (New York) Ltd.	—
Rubber Latex Ltd.	300
Rubber Regenerating Co. Ltd., The	Cover iv
Scott Bader & Co. Ltd.	—
Sealants Ltd.	—
Shaw, Francis, & Co. Ltd.	iv
Shell International Chemical Co. Ltd.	—
Smith, Alfred, Ltd.	v
Smith, Wilfrid, Ltd.	—
Squire, Frederick, Ltd.	—
Stechler, L., & Co. Ltd.	—
Steel, J. M., & Co. Ltd.	—
Steele & Cowlishaw Ltd.	—
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Storeys of Lancaster	—
Stott, James, Ltd.	—
Sturge, John & E., Ltd.	—
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Sutcliffe Speakman & Co. Ltd.	—
Tanner Bros. (Greenfield) Ltd.	—
Tilghman's Ltd.	—
Union Carbide Ltd.	—
United Norit Sales Corporation Ltd.	—
United Wire Works Ltd., The	—
Universal Oil Co. Ltd.	293
Universal Oil Products Co.	—
Vacu-Blast Ltd.	—
Verson Engineering Co. Ltd.	—
Wallace, H. W., & Co. Ltd.	—
Wallis Engineering Co.	—
Washington Chemicals	—
Webb, W. F. (Engineers) Ltd.	308
Welwyn Tool Co. Ltd.	—
Whiffen & Sons Ltd.	—
Witco Chemical Co. Ltd.	296
Zama Ltd.	—

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